ILLUMINATING ENGINEERING

SEPTEMBER 1954

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THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

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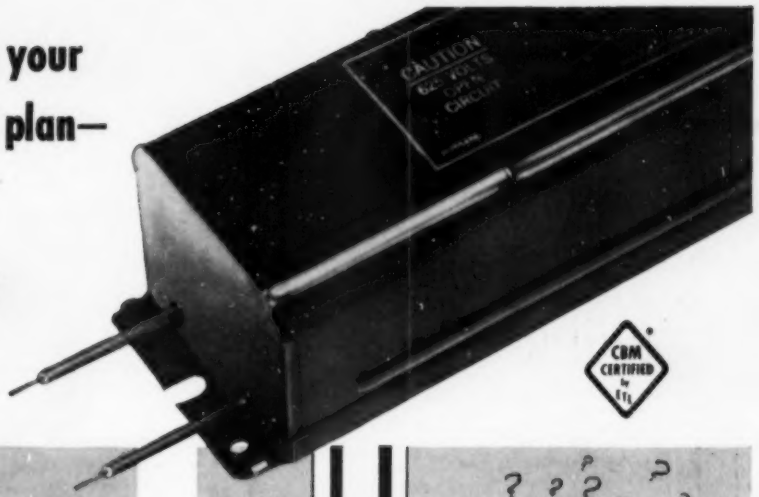

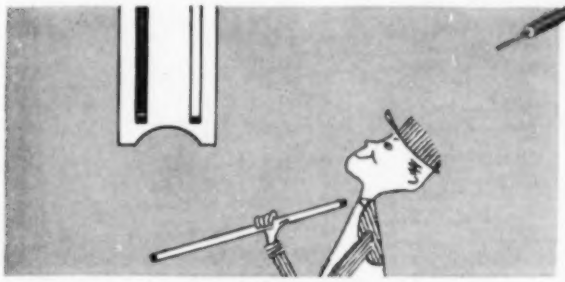

Lead-Lag—When outage of a single lamp occurs in a group of lamps operated on two-lamp *lead-lag* ballasts, the lumen output of the other lamp is not affected.

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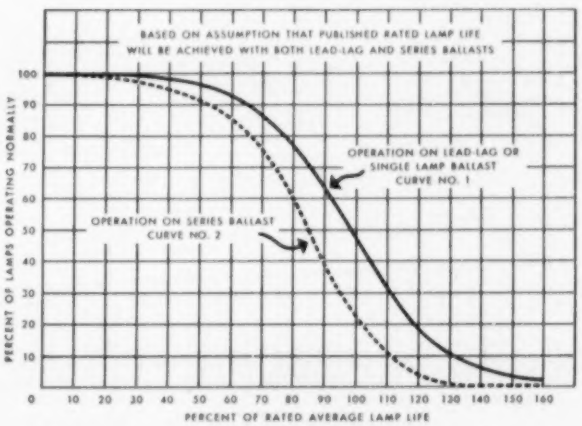
Compare these curves. You will see an important increase in economy of *lead-lag* over series operation for installations using group lamp replacement. This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OPERATION ON LEAD-LAG OR SINGLE LAMP BALLAST CURVE NO. 1
OPERATION ON SERIES BALLAST CURVE NO. 2
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80
70
60
50
40
30
20
10
0
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
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TESTS OF FLUORESCENT LAMP BALLASTS

PAGE 1 OF 1

MFR Starring & Co. Inc. PLANT Bridgeport, Conn. DATE SELECTED 5/12/54 BY ETL ORDER NO. 22462-19
CAT. NO. 240-277 FOR 2 (DEPT.) DATE RECEIVED 5/12/54 MFR'S ORDER NO.
RATING WATTS 240 VOLTS 277 MA. 425 CYCLES 60 DATE TESTED 5/12/54-5/14/54 TESTED BY A.T.C. DATA APPROVED [illegible]

ETL SPEC. NO.	CIRCUIT	SUPPLY VOLTAGE	MINIMUM OPEN CIRCUIT VOLTAGE AT RUN	AT START	INPUT TO REFERENCE LAMP VOLTAGE	RMS CURRENT MA.	POWER WATTS	PEAK CURRENT	RATIO PEAK TO RMS CURRENT	POWER FACTOR %	ETL BALLAST LOSS AT RATED VOLTS WATTS	OVERALL POWER FACTOR %	BASE GRADE	VOLTAGE ACROSS STARTER TERMINALS VOLTS	DI-ELECTRIC TEST	IRR RES. OHMS	TIME SET	AMBIENT TEMP °C	TOTAL RESISTANCE OHMS: BLACK MA.	BLACK VOLTS	WHITE RED	WHITE BLUE	YELLOW BLUE	CONCEDED TEMP °C
																			SPEC NOS. 5-100—Normal					
	Current				185.0	0.425	40.6											39	66.20	17.25	47.65	83.96	72.80	40
"		216			176.0	0.381	34.0										Mah Temp	C		76.5	79.0	78.0	86.0	77.5	
"		228			196.0	0.415	40.2										Temp 1/16	C		77.5	81.0	80.0	93.0	82.5	
"		240			199.0	0.478	46.0										Mah Resist	O	32	76.70	23.01	39.65	93.45	82.80	53
"		216			176.0	0.365	34.0																		
"		228			187.0	0.415	36.6																		
"		240			196.0	0.478	44.8																		
5-98	Mod	277	172	320		0.432	39.6	0.690	1.48	0.536															
	Mah	"	187	810		0.474	46.0	0.880	1.47	0.680															
5-99	Mod	"				0.387	37.0																		
	Mah	"	193	320		0.465	39.8	0.780			13.5	97.8													
	Mah	"	188	805		0.590	38.0	0.870	1.64	0.550															
	Mah	"				0.370	34.8		1.61	0.604															
5-100	Mod	240	174				36.0				16.5	96.1													
	Mah	"	184				36.0																		
	Mod	277					31.0																		
	Mah	"				0.464	44.0	0.660	1.54	0.559															
	Mah	"				0.398	38.0	0.600	1.51	0.620															
	Mod	228		320		0.396	36.3				16.3	100.0													
	Mah	"		810			42.4																		
5-101	Mod	240	173				36.0																		
	Mah	"	188				39.0																		
	Mod	277					31.0																		
	Mah	"				0.412	44.8	0.748	1.64	0.590															
	Mah	"				0.440	39.0	0.660	1.50	0.610															
	Mod	240				0.357	37.3				18.5	100.0													
	Mah	"		320			44.4																		
5-102	Mod	240	192	810			41.6																		
	Mah	"	188				38.8																		
	Mod	277				0.424	39.6	0.670	1.58	0.557															
	Mah	"				0.465	38.8	0.610	1.51	0.660															
	Mod	240		320		0.394	36.9				16.9	100.0													
	Mah	"		810			43.8																		
5-103	Mod	240	196.0	0.442	40.2																				
	Mah		196.0	0.468	39.6																				

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ILLUMINATING ENGINEERING

THE JOURNAL OF THE ILLUMINATING ENGINEERING SOCIETY

SEPTEMBER 1954

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Founded 1906

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The President's Address

By A. HOMER MARWARING
President, 1953-1954

IT IS INDEED a great pleasure to speak to you today with what we might term a brief travelogue followed by a short "State of the Society" address.

This year, we took a trip covering over 15,000 miles attending all regional conferences of our Society. We were profoundly impressed by these most essential regional conferences — New Orleans was our first; beautifully managed from its opening session to its closing banquet. It could never take a back seat to any National Technical Conference. Anyone who has conducted a regional conference and a national know that both take equal preparation whether for 200 members or 800 members. One most impressive innovation at New Orleans was the holding of papers sessions at luncheons. These were extremely well attended and full discussion ensued. Congratulations to the conference chairman, Conrad Berdon, his excellent committee and Regional Vice-President, Glenn Park.

As has been our policy during the last few years we held our April Council Meeting outside of New York. Due to the location of the Southern and Southwestern Regional Conferences, it was decided by Council to accept New Orleans' invitation. This meeting was most successful due primarily to the participation of the Southern and Southwestern Conference proxies attending the meeting. I know they learned a lot, but believe me, so did the members of our own Executive Committee and the Council members who attended.

Our next stop was Houston, Texas to attend the Southwestern Regional Conference. It was a most delightful conference held in one of our most progressive cities. There was a fine attendance with a reception given by the Mayor inaugurating a large installation of new street lighting equipment. This conference was very successful through the management of George Trotter, his fine committee and John Myers, Regional Vice-President.

We then started a long railroad trip to Denver to attend the Inter-Mountain Regional Conference. This was their first, and most ably handled by Harold Rankin and Jim Buck, the Regional Vice-President. Two things impressed me very much; the large delegation from Phoenix and the excellent papers delivered and discussed by the local members.

The trip to San Francisco was most picturesque; the majority of the time we spent in a streamlined astrodome Pullman viewing the magnificent scenery. Arriving in San Francisco we were met by John Walsh, taken to the Mark Hopkins Hotel. Next morning proceeded to the San Francisco Museum of Art.

There John Walsh and his committee presented a most interesting program, a portion in cooperation with the American Institute of Architects. This portion of the program was very enlightening to our members as well as those of the A.I.A. We strongly recommend that Regional Conferences should try this type of cooperation with the architects, for it should prove most fruitful. The lighting effects and their symposium of light made this conference extremely interesting. John Walsh, his committee and Regional Vice-President Leonard Hobbs did excellent work in presenting an outstanding conference. After a delightful banquet at the Mark Hopkins Hotel, we left the next morning for Seattle arriving there the following afternoon.

The Pacific Northwest Conference was held at

the Benjamin Franklin Hotel. The facilities were excellent with outstanding lighting in the conference room. Their program featured panel sessions with national speakers and as you can well imagine there was plenty of discussion which always assures a successful conference. Outstanding preparation was necessary for this conference and its success was due to the fine work of Mr. Hollingsworth, his fine committee and Regional Vice-President Walter Lind. Unfortunately, due to train connections, it was necessary that we leave Friday afternoon before the close of this fine conference with its most enjoyable entertainment.

At this point in our tour we arranged a two-day rest stop at Sun Valley, Idaho. It was very delightful as anyone could well imagine.

Wednesday morning, April 28th, we arrived in the City of Toronto. The weather was crisp, a little different than Houston at 88°. The conference had just started, and continued as it started, in a most efficient manner. The program was well planned and inspired good discussion. The luncheons, recepions and banquet were extremely well handled. All members attending certainly found it most worth while, proving that thorough planning will provide a good conference. The responsibility for this fine conference fell in the hands of Mr. Mayberry, his excellent committee and Mr. Hastings, the Regional Vice-President.

Sunday, we held our Executive Committee meeting in Detroit at the Sheraton-Cadillac Hotel; several members of the Great Lakes Conference attending. Following the Executive Committee Meeting there was a Regional Activities meeting and then in the morning the Great Lakes Conference. The committee in Detroit is to certainly be congratulated on a Regional Conference that comes closer to any National Technical Conference than any other that I have had the opportunity of attending. The room in which the sessions were held was beautifully illuminated and a stage provided by one of the sustaining members permitted highlighting of the speaker, dimming and highlighting of the session chairman. The projection screen was one of the largest and most effective I have ever seen. I know all members attending gained much from this splendid meeting. Congratulations to Al Sangster and his excellent committee and Lester Twichell, the Regional Vice-President.

The Northeastern Regional Conference was the next attended. It was held at a restaurant outside of Hartford and called for a one-day meeting. Everyone was most pleasantly surprised to see over 135 in attendance. This conference, although taking only one day offered a very full program and all sessions were well attended. The meeting place was quite a distance from town, which permitted a minimum of distraction. George Taylor, Regional V-P, and Francis Clark, Conference Chairman, are to be congratulated on a most successful experiment.

St. Louis was the home of the Midwestern Regional Conference. It was held at the air-conditioned Jefferson Hotel. The facilities of this hotel combined with the excellent work of the conference committee provided a finished conference for the members attending. The program was well rounded presenting papers of interest to the electrical engineer, architectural engineer and the consulting engineer. Lee Wallace, Carter Lewis and their committees are to be congratulated on their splendid work.

Up to this point you may or may not have noticed I made no mention of the Ladies' Activities. Let me say now they are one of our greatest assets in making a conference enjoyable and each and every conference had a splendid well-planned program that worked both day and night to make everyone's stay most enjoyable. They are due our thanks and congratulations.

You may have wondered why I have taken the time to brief our Regional Conferences and I apologize that time does not permit a more lengthy discussion. Fellow members, in my opinion, each year Regional Conferences are becoming more important and each year through experience, far more efficient in their operation.

As an experiment this year I was extremely fortunate to have members of our Headquarters staff accompany me to six of our nine Regional Conferences. Their help was invaluable to our regional membership and next year I would suggest, if possible, their attending regionals not covered this year and any others they may find possible to attend.

I think very few of us realize the greatness of the Society of which we are fortunate enough to be members. Traveling throughout the country I have made it a point to call everyone's attention to the outstanding benefits our Society has to offer:

(1) We have without exception one of the most capable and efficient headquarters staffs of any association with which I have had the opportunity of working.

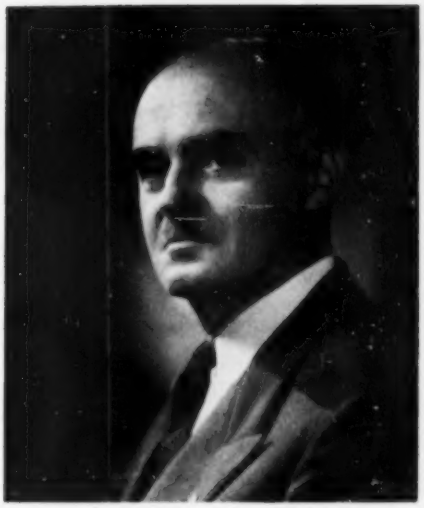
(2) Our technical and application committees, the life blood of our Society, speak for themselves. You will receive a complete report concerning this from President-elect, Duncan Jones.

(3) Your administrative and publications com-

(Continued on page 449)

A Message from the President-Elect on

The Coming Year In I. E. S. Progress



By DUNCAN M. JONES
President, 1954-1955

ELECTION to the office of President of the Illuminating Engineering Society is an honor deeply felt by all who achieve it. As the first member from Canada to hold this office, I have in addition to this natural pride, a profound sense of responsibility and appreciation for your confidence. Canadian members of I.E.S. share this with me.

In its eighty-seven years since Confederation, Canada has travelled fast and far along the road to progress. Always it is proud of the respect and recognition it achieves in local, continental and world affairs. Collectively and individually it is ever grateful for the support given, and the confidence placed in its people by those of other countries.

As recipient of this honour, I shall cherish this day particularly because my induction takes place at the same time as two historical celebrations are in progress. A century of providing enjoyment and pleasure for countless numbers of visitors from all parts of the world is being celebrated by this popular resort, Atlantic City. May they add many more years to their achievements.

Seventy-five years of lighting history is the other celebration. One that commemorates the construction of the first practical electric light source by Thomas A. Edison. Years of steady inventive progress that have made it possible for this Society to grow to its present stature. A celebration expertly labelled "Light's Diamond Jubilee," and carrying with it the commanding slogan "Light for Freedom — Power for Progress."

My appointment comes at an interval when times are not quite normal. When international problems appear to multiply; when the roots of our national economy may be affected; and when technical miracles are unfolding so rapidly that we hardly know what to expect next. Military necessity has provided great impetus for the tremendous amount of research and scientific probing being executed by almost every possible agency. It is gratifying to realize as the days pass that this necessity has developed a strong desire to direct the practical use of new concepts and inventions toward providing those properties that will assure better health, more comfortable living and working conditions and greater freedom, pleasure, peace and safety for all peoples.

This Society can be proud of the many contributions it has made in the interests of public welfare. "Light for Freedom" is a slogan that embodies the very essence of the properties mentioned, and one that freely expresses the service rendered by this Society.

Much is owed to those who diligently contribute their time, energy and imagination to the work of our technical and application committees. Our achievements can be very largely credited to their endeavors. They are few in number when compared with the total of our membership. More of our members are needed for this important work. It is their duty to offer their services, and our task continually to seek new talent.

Our last two presidents embarked on a program, intensifying previous programs, to strengthen and stimulate the activities of these committees. Judging from the number of studies now in stages of completion or under review, we can safely say this was a wise move. New reports, the fruit of many meetings and discussions, will gradually produce new and improved practices which will have far

reaching effects in the application of illumination design. It is my desire to encourage this program and inject, if possible, further incentive.

My own experience with our technical program, and a quick review of committee activities, indicates that while they deserve endless praise, many of them may be reaching a crossroads. It would seem that committee deliberations have been based to some extent on concepts born from past research — bases which are now outmoded and not sufficient to satisfy the appetite or progressive ambitions of these committees. Repeated references to the relationship of light to vision; how light affects people; inadequacy surrounding quality standards and methods of measurement, and many other similar posers strengthen the belief that we may be lacking in basic data, and should take steps to expand our research efforts to probe and discover new and unexplored concepts.

We have some research investigation in process, and other research projects in operation. The question is — "Are we keeping pace in this age of scientific development?" A decisive move in this direction this year might prove to be convincing and profitable.

We are fundamentally a technical society, and for this reason we have an important role to play in the present scientific race. Surely, we will be judged, more fully recognised and respected by the public and our associates through our actions in this direction. To gain the professional respect and confidence we richly deserve, we should be on our guard to stress at every opportunity our efforts in research, the skill of our technical committees, the value of our recommended practices and the usefulness of our technical publications. This is mentioned because it is my belief that our future depends first and foremost on the technical aspirations of the Society and its members.

We are a fortunate, and in some ways an unfortunate body. We are fortunate in that our classifications of membership permit a range that covers scientist to technician, professor to scholar, professional to non-profesional, executive to salesman and government to allied interests. Our work forms a travelling belt that carries the knowledge conceived and disseminated through research and technical analysis, direct to the people within our industry.

We might be said to be unfortunate in that this very situation creates in the minds of some that we are not strictly a technical society. They question our right to the terms "engineer" and "engineering." While we do not wish to make an issue of this, it is a cloud that we should attempt to dissolve. Much criticism, in my opinion, comes about through the abuse given the term "engineer," particularly when applied to the title "illuminating engineer." No one should use this title who is not strictly qualified or licensed to attach this designation to his occupation. Such abuse only tends to lower the confidence and trust we seek, and the respect and dignity we strive to maintain.

We should review our former study on the matter of professional requisites as it relates to our classification of membership and seriously consider changes that would establish a more professional atmosphere to the Society and to those members qualified to apply the title engineer to their occupation.

As already indicated, the nature of our reputation and success depends on our technical triumphs. The maintenance of this reputation and the guarantee for continued success rest, however, in the actions of our vast membership spread over the continent in our Regions, through our Sections and Chapters. Here are the veins that keep us alive and furnish us with the desire and dynamic urge to elevate the Society to greater heights of attainment.

The past few years have produced quite a change in the pattern and operation of Regions, Sections and Chapters. This change has been developed through the strenuous work and devoted effort of the Local Activities Committee, now known as the Regional Activities Committee. This committee is composed of the ten Regional Vice-Presidents of I.E.S., under the Chairmanship of the Junior Vice-President. For the last two years it has met the day before each Council meeting, and at Regional and National Conferences as well. This is the committee that hears and considers all the problems of the Sections and Chapters, of Regional Vice-Presidents and their Regional Conferences — even those of individual members. It receives for discussion and solution almost every problem in operational matters that arises in the Society. One visit to this committee would startle anyone, to see the vast territory they cover, the number of subjects they deal with, and the value to the Society of the numerous decisions they make and actions they carry through to conclusion.

The committee has, in a short period of time, firmly established the position of the Regional Vice-President. This is a position that calls not only for one willing to donate his time, but for one qualified and inspired to give sound leadership, expert guidance, and forceful drive to increase the interest and activities of the Sections and Chapters in his Region. Of course, in addition to these duties he must organize and conduct his Regional Confer-

(Continued on page 449)

Abstracts . . .

of papers presented at the 1954 I.E.S. National Technical Conference pertaining to environment, quantity, quality, color

L. C. Kalff

The Luminous Environment

WE UNDERSTAND environment to be the things that we see around the visual task in the visual field. We know about many studies of glare, contrasts, luminance and color. It seems typical that the studies about the first three subjects are being done by physical and technical specialists, many of whom are working in lamp manufacturies. Their education does not lead these people to the study of psychological factors in human seeing. They are in the first place out for simple rules and formulae and calculating factors. Consequently their studies generally lead towards negative recommendations. The study of color, however, is done in the first place by students of psychology, sometimes medical people and paint manufacturers and their recommendations are mostly positive. We want to indicate this typical difference because the results of the two studies are certainly not on the same level and for that reason can hardly be combined.

Our visual aim is human well-being and comfortable seeing. It is obvious that seeing requires a combination of the factors light and color. If we want to make human seeing comfortable we will have to find as a result to our studies positive recommendations. This means that all negative rules are only a start. If we calculate light and color as the main factor influencing human seeing, we must not forget the lines in the picture in our visual field, because they can also be of great influence upon the impression we get. Since 1949 I have studied the subject of comfortable seeing after having been for many years very much dissatisfied with current methods. I do not say that these studies lead to nothing, but they do not lead far enough. We here want to mention a few of our objections:

The study of brightness contrasts has up till now always been carried out on objects where the contrasts are abrupt, without any transitional zones between the two luminances. These circumstances hardly ever occur in reality. It is true that if one includes intermediate zones between two surfaces of a given luminance, the study becomes much more difficult and the results rather vague, but in reality these are the circumstances that should count (Studies by Hopkinson and others). The recommendations are negative, not more than 1:4 or 1:10. We know that too little contrast can be as tiring as too much, and that much bigger contrasts are comfortable with the necessary transitions.

Recommendations for lighting values depend mainly on economical arguments and on the study of maximal performance of the eye (Dr. Weston). This study, however, does not imply comfort.

Glare as long as it is really unacceptable should of course be avoided, but it is very difficult to decide when glare really is objectionable. Sometimes it is even very nice and it all depends on the mood of the observer and the atmosphere of the place (candles, illuminations, fireworks) (Ward Harrison).

The study of the visual field and the brightness thereof should include the whole human visual field as we see it. We have never understood why one should exclude those parts of the visual field we

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see only with one eye (Logan). All calculations concerning brightness values are being carried out without consideration of color. This is, we feel, fundamentally wrong.

We believe that we will always stay very distant from reality as long as we do not approach these problems purely from the human angle, allowing intuition to dominate reasoning, because reasoning is always insufficient as long as human sensations are concerned. We should then try to find methods of experimenting, staying as near as possible to reality and derive from these experiments confidence inspiring rules that are perhaps vague, but which will lead the architect, the interior decorator and the lighting man to think cooperatively and work together. For those who have not had the opportunity to get familiar with our theories that have been published for the first time in 1950 in Stockholm for the congress of the C.I.E. we will give a short summary of it.

We feel the necessity to cooperate with other people in this aspect. We are convinced that one person in only one short lifetime will never find the necessary results of any value. We therefore think that an international team should be created, of people who think along similar lines and that this team should agree about the methods to follow and about the subjects to tackle. This international team should work through the whole period between two international congresses of the C.I.E. without interference of National Secretariats which only form a resistance. Enthusiasm for this kind of work should be inspired by interest in human welfare, putting aside all selfish striving for personal success. We believe that C.I.E. by its methods and systems of working up to this time, has not been a proper medium. We very much hope that the next congress in Zürich in 1955 will lead to a new way of cooperation in the sense we have just indicated.

How You Respond to Temperature Changes

By Nathaniel Glickman

IN THE PROCESS of evolution man and the other mammals have arrived at a certain optimal temperature for the body cells, and the organism strives to maintain this temperature as closely as possible. In order to maintain this optimal temperature over a wide range in environmental temperatures, heat production and heat elimination must be in equilibrium. Heat production remains relatively constant until the body develops a fever or is cooled sufficiently to cause increased muscle tenseness or shivering. The manner in which heat is eliminated from the body changes as the environmental temperature changes. In a cool environment most of the heat is lost by radiation, whereas in a warm or hot environment most or all of the heat is lost by evaporation.

The body is called upon to make certain adjustments when an individual suddenly enters or leaves an air conditioned space during the hot summer months. Do these adjustments constitute a "shock" and are they harmful? Such questions are still being asked. Observations on skin and rectal temperature, heart rate, blood pressure, evaporative weight loss and thermal sensations (comfort votes) are included in the paper. The adjustments occur rapidly and place little strain on the cardiovascular system of healthy young adults. Further, the responses of cardiac patients are similar in most respects to those of young normal subjects. The effects of age, clothing and season on these adjustments are to be published in the paper.

There are optimum conditions for comfort. In a room air conditioned for comfort, holding a large number of people, most of them will be comfortable; a few will be cool and a few will be warm. There are a number of reasons for these individual variations. Some of the reasons include level of activity, type and amount of clothing, metabolic effect of food, abnormal heat production, drafts and non-uniform radiation.

Some individuals are more susceptible to heat than others. These individuals may faint while standing quietly on a hot summer day. As a result of the pooling of the blood in the greatly dilated blood vessels, particularly in the legs and feet, the normal reflexes may not compensate for the erect posture. The blood pressure drops quite low and the heart rate becomes markedly elevated. This is a type of heat exhaustion.

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The Acoustic Environment

Robert B. Newman

THE ACOUSTIC environment, like all other aspects of environment, can be considered only in terms of its effects on human beings. There is both the problem of providing a comfortable acoustic environment for everyday working and living conditions, and also the problem of establishing a suitable environment for easy communication between people in direct conversation, in telephone conversation, etc.

The optimum acoustic environment for various types of activities cannot be described in terms of single numbers (overall noise level, reverberation time, or the like), but must be described more completely in terms of frequency spectrum of background noise, its dynamic characteristics (continuous, intermittent, etc.), reverberation characteristics of the enclosure, presence or absence of focusing, flutter echoes, etc. Too much noise can be injurious to the hearing mechanism; too little noise can be extremely disagreeable. Experience has proved that in a large number of everyday situations, a person's evaluation of his acoustic environment is based on the ease with which he can communicate with others. We also find that in most situations the presence of noise actually makes the environment seem quieter in that it masks or hides unwanted intrusions from neighboring spaces. The use of such "acoustic perfume" is a very important technique in establishing a good acoustic environment.

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Quality of Lighting

Sylvester K. Guth

THE DESIRE for comfortable lighting is not a new one for our Society. Many have tried, with varying degrees of acceptance, to formulate specifications of brightness limitations and methods of evaluating the comfort or discomfort produced by them. Unfortunately, the lack of adequate experimental evidence has severely hampered the development of anything but empirical specifications and methods, especially with regard to luminaire brightnesses. However, in recent years, more complete data have become available. It seems worthwhile to review briefly where we now stand and how these new data may influence certain aspects of current and future lighting practice. In a sense, this paper may be considered as a preview of some of the material which will be included in a report of the Committee on Standards of Quality and Quantity for Interior Illumination.

Ten years ago the S.Q.Q. Committee issued its Report No. 1, *Brightness and Brightness Ratios.* We have had considerable opportunity to determine whether its brightness recommendations were satisfactory. In general, there seems to have been little dissent from the brightness ratios between a visual task and its surround. On the other hand, there have been many pro and con viewpoints expressed regarding the ratios and brightnesses recommended for luminaires. Some believe that the ratios were unnecessarily restrictive, while others felt that the ratios should be adhered to implicitly. In spite of the resultant differences and sometimes confusing situations, Report No. 1

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did much toward raising the general standard of lighting practice.

Three groups of researchers have made major contributions to our basic knowledge on the subject of discomfort glare during the past several years. Differences in procedures, criteria, observers, etc., make direct comparison of the individual experimental results somewhat difficult. However, the relative effects of the various factors involved can be compared. Evaluating the results obtained by Vermeulen and deBoer, Luckiesh and Guth, and Petherbridge and Hopkinson, it is found that there is general agreement among them. That is, the effect upon source brightness of source area and position, number of sources, and surround brightnesses as determined by each are sufficiently consistent to indicate that a sound and practical method for evaluating lighting systems is no longer a thing of the distant future.

During the same period a number of empirical methods for predetermining or rating the comfort of lighting installations have been proposed. The Harrison-Meaker Glare Rating Method was the first. Originally, it was based upon the Luckiesh-Holladay data plus such modifications that seemed to be indicated to make it applicable to modern lighting equipments. It has been somewhat changed to take into consideration some of the newer experimental data. It is admittedly empirical and, therefore, has some limitations. Nevertheless, it has been used successfully, especially as a means of comparing different types of lighting systems. Of particular significance is its rather general agreement with experience. More recently, Logan and Lange have suggested a method which is based upon the Luckiesh-Guth data. While some of the ratings obtained with this method appear to be in line, several of the mathematical steps involved are open to question. Luckiesh and Guth suggested a method of combining groups of sources, similar to one offered by Petherbridge and Hopkinson. In several experiments they confirmed that all sources could be grouped at the position of the one closest to the line of vision. Nevertheless, it, too, has several limitations which must be resolved. A significant forward step is that comfort evaluations are being expressed in terms of the percentage of people who will be visually comfortable.

There are similarities and differences among these comfort rating methods. All are based generally upon the same experimental evidence, but each represents a somewhat different viewpoint of how the data are best applied to evaluating comfort.

There should be no difficulty in integrating the results of the S.Q.Q. Committee findings, which may become an I.E.S. method, into the present visual comfort tables. There may be some changes in numerical values, but no abandonment of the basic concept of interpretation. The considerable thought being given to this subject by the user of light and the illuminating engineers certainly is indicative of the acceptance it will receive.

The Use of Visual Performance Data To Specify The Quantity and Quality of Interior Illumination

H. Richard Blackwell

THE ADEQUACY of visual performance, as measured by speed and accuracy, has been shown to depend upon both the quantity and quality of interior illumination. In fact, visual performance continues to serve as one of the two principal criteria for specification of the quantity and quality of illumination, the other criterion being visual comfort. Various methods for using visual performance data for specification of illumination have been suggested. Best known of these methods are: (a) Weston's performance graphs; (b) Moon and Spencer's Delos Method; and (c) the Luckiesh-Moss Visibility Meter. In two earlier reports to the Society,[1,2] the author has proposed elements of a fourth method. The present paper contains a more complete statement of this method and an example of its use with one rather complete set of visual performance data.

The data selected to illustrate the method of

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specifying interior illumination consist of experimental relations between speed and accuracy and task illumination, for tasks differing in angular subtense and contrast. The visual task required of the subjects was the discrimination of the presence of a difference in brightness (luminance) between a circular target and its general background. All measurements were made under conditions of uniform general brightness in the visual field surrounding the task. A portion of the data were reported by the author elsewhere[3] in 1946. The remainder were reported to the Society[1] in 1952. The data from the two studies are combined here for the first time.

In previous reports of these data, they have been presented in graphs relating illumination to the percentage brightness difference (contrast) just required for a given level of speed and accuracy, with separate curves for tasks of different angular subtense. With the data presented in this form, it is difficult to assess the effect of illumination in increasing speed and accuracy. In the present paper, the data are presented in graphs relating speed and accuracy to task illumination for tasks of given angular subtense and contrast. From these graphs, it is easy to assess the gains in speed and accuracy to be expected from increases in task illumination. In this form, the data may also be compared with Weston's graphs more easily.

Brightness non-uniformity in the visual field surrounding a visual task has been repeatedly shown to impair visual performance. This effect of brightness non-uniformity is known as "disability glare." Moon and Spencer[4] have summarized studies of this effect and have shown that disability glare can be simulated by a "veiling brightness" which increases the effective brightness of the visual field and decreases the task contrast with the surround. Using quantitative statements of these effects of disability glare, it is possible to compute quantitative changes in visual performance to be expected in the presence of disability glare. The brightness discrimination data have been recomputed to include the influences of disability glare. Computations have been carried through to the point of graphs relating speed and accuracy to task illumination for tasks of fixed angular subtense and contrast.

Sets of graphs relating speed and accuracy to task illumination for various visual tasks, with and without disability glare, can be used to specify the quantity and quality of interior illumination. Indeed, these graphs make it possible for the first time to assess the inter-relations between quantity and quality of illumination. For the first time, it is possible to establish whether an increase in quantity will or will not increase visual performance, if the increase in quantity must be accompanied by a reduction in the quality of illumination.

Practical problems encountered in using visual performance data, such as those presented in the paper, in practical lighting installations will be discussed. In addition, the relations between the results of this analysis and results obtained from Weston's graphs and from the Delos Method will be indicated.

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Color and Seeing

By Harry Helson

COLOR in the source of light is of importance because it affects the color of every object in the field of view and thereby determines the adaptive state of the eye. Studies dealing with effects of color of illuminant on visual acuity, visibility, legibility, speed of vision, fatigue, and emotional effects, have yielded contradictory results for the following reasons:

(1) Failure to use the same color of objects and of background in studies by various investigators. Colors of walls, ceiling and floors may also influence results.

(2) Since different visual functions do not necessarily correlate with each other an illuminant which gives excellent results when some visual functions are measured may give entirely different results when other visual functions are measured.

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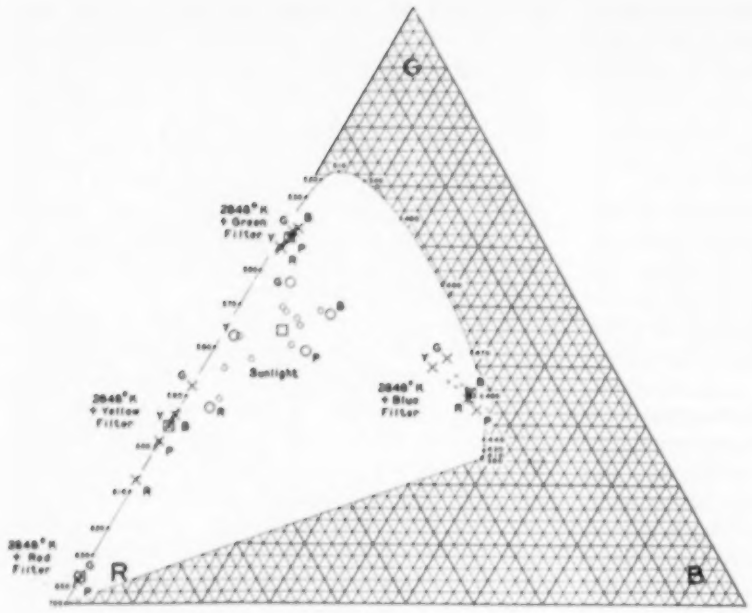

Figure 1. Seventy-five illuminant sample combinations represented on the uniform-chromaticity scale Maxwell triangle. The samples with Abbot-Priest sunlight as the illuminant are shown by circles; those for the four strongly selective illuminants (red, yellow, green, blue) are shown by crosses. The illuminants are indicated by squares. (From D. B. Judd: "Hue, Saturation and Lightness of Surface Colors with Chromatic Illumination," *J. Res. Nat. Bur. Standards*, 1940, *24*, page 310, RP 1285.

(3) Even different methods of measuring the same visual functions may yield widely different results. Generalizations regarding color rendition of different illuminants depend greatly on the particular method of measuring chromatic adaptation.

(4) Since colors achieve maximal saturation at different intensities, equal illuminances do not guarantee equal chromaticness as shown by the data in Table I. If we take maximum saturation for violet as unity, green requires from 7 to 17 units for maximal saturation, greenyellow from 21 to 24 units, yellow 19 units, orange from 4 to 15 units, and red 5 units. As yet no studies have been made equalizing chromaticness of sources having different spectral energies.

(5) Color in the illuminant affects light and dark objects differently: while light objects are tinged with the hue of the illuminant, dark objects are tinged with a hue complementary to the illuminant hue so that some effects of color in the illuminant are due to the illuminant hue while others are due to the complementary hue which it induces in dark parts of the visual field.

What color is best in a source of light depends on the purpose for which it is intended. Thus to maximize the largest number of differences among colors, daylight or sunlight is best shown by the plots in Fig. 1 of 15 colored samples in five illuminants. But to detect minimal amounts of chroma in various products some color in the light source is desirable. A very special case is the improved acuity of some color deviant individuals who discriminate pseudoisochromatic plates better in yellowish (tungsten) light than in Macbeth daylight. All in all the eyes function efficiently in widely different types of illumination and only when special problems arise is it necessary to prescribe specific energy distributions for their solution.

TABLE I.—Intensity Necessary for Maximal Saturation.

(From data obtained by D. McL. Purdy quoted by L. T. Troland, *Principles of Psychophysiology*, Vol. II, D. Van Nostrand Co., New York, 1930, p. 169.)

Hue	Wavelength	Intensity (photons/9)
Red	700	4.66
Violet	440	1.00
	460	1.33
Blue	470	1.66
BG	480	2.66
	490	2.11
Green	505	6.90
	515	9.44
	525	17.20
GY	540	21.44
	555	20.20
	565	24.37
Yellow	575	19.44
Orange	585	14.90
	592	7.11
	600	5.44
	620	6.33
	635	4.00
Red	660	4.90

Abstracts from Papers
pertaining to

Outdoor Lighting

Civil Defense Illumination Control Plan May Eliminate Need for Future Blackouts

Col. Barnet W. Beers

U. S. Army Photograph

A PLAN for illumination control (CONILLUM) to reduce "skyglow," which could give navigational aid to enemy aircraft in an attack on principal United States target cities, has been developed by the Department of Defense in cooperation with the Federal Civil Defense Administration.

Objective of the plan is twofold: (1) to reduce skyglow — the towerlike shaft of light reflected from the normal lighting pattern of a modern city, which is visible at high altitudes — by 75 per cent, and (2) to reduce lighting in specified areas by 75 per cent to minimize the danger of silhouetting vessels against coastal lights. This would eliminate need for complete blackouts with which the public became familiar during World War II.

Secretary of Defense Charles E. Wilson, commenting on the program, emphasized that such a plan is a military defense requirement, and termed its success dependent upon "the effective cooperatio of the public, industry, and Government."

Federal Civil Defense Administrator Val Peterson also stated that: "At the request of the Department of Defense, the Federal Civil Defense Administration will undertake to implement skyglow control with the cooperation of State and local civil defense organizations."

Skyglow control normally will be confined to areas designated by the Secretary of Defense in consultation with the Federal Civil Defense Administrator. Farms and small villages and other communities distant from heavily-populated cities would be exempt from the requirements.

For CONILLUM to be effective, certain commercial, industrial, and municipal preparations will have to be made.

Outdoor advertising lights and exterior floodlights which contribute to skyglow would be restricted. Street lights would be shielded to reduce upward light. On well-lighted roadways, motor vehicles would be permitted to use parking lights only. Lower headlight beams would be permitted on unlighted and poorly lighted roadways.

In residential buildings, including apartment houses and hotels, ordinary window coverings (window shades, venetian blinds or drapes), would be adjusted to permit no emission of direct light above the horizontal. In non-residential buildings, not including industrial buildings, window coverings could be drawn.

The plan will actually be placed into effect when ordered by the President; by concurrent resolution of the Congress; or by Commander, Air Defense Command, if a hostile attack on the United States is probable (Warning Yellow), or imminent (Warning Red).

With modern navigational aids, including electronic devices, aerial combat crews can guide aircraft to designated targets and hit them with relatively good accuracy without relying on visibility

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of the ground. Any combat crew, however, welcomes any assistance which might serve as a check on the accuracy of their instruments and positively identify the target.

Two major aids helpful to air crews at night are radio emissions from AM radio stations operating on designated frequencies and skyglow. CONELRAD, the plan that permits emergency radio broadcasting but scrambles AM radio signals, deny them the first; and CONILLUM, if effective, will deny them the second. Effective operation of both plans forces aviators to rely on other navigational means, which at times may prove unreliable because of natural phenomena.

By checking the location of skyglow from one city against that from another city and comparing their size, brilliance and relationship, a navigator can fix his location on his map with greater certainty.

Designed to require the very minimum control of light, CONILLUM plans were formulated by the Departments of the Army, Navy, and Air Force, the Federal Civil Defense Administration, the Illuminating Engineering Society of America and others.

Detailed plans for local application will be worked out by the Federal and State Civil Defense Administrators. These plans, explaining how the individual can assist in the control of lighting, will be announced at a later date.

M. E. Keck

W. A. Oglesbee

Operation of Mercury Vapor Lamps On Series Street Lighting Circuits

THE INTRODUCTION and sale of constant current regulators with a current rating identical to the operating current of an E-H1 400-watt mercury vapor lamp introduces a number of problems to the lighting engineer who specifies street lighting equipment. It is fairly simple to calculate the actual savings both in initial cost and in operating cost that may be expected from such a system in comparison to any other distribution system. It is not so easy to evaluate the intangible operating and maintenance problems which do not appear on a cost analysis of a proposed system.

The purpose of this paper is to present, on a technical basis, the results of a careful investigation into the operating characteristics of several systems utilizing a constant current transformer and series circuit with no insulating or current transformers to isolate the mercury lamps from the series circuits. The paper indicates the components necessary for such a circuit and discusses in some detail the function and operating limitations of each such component.

It was found that possible operating problems include such factors as these:

1. A high voltage series circuit must be carried into the luminaire head. This creates problems in luminaire design and necessitates the recommendation that the luminaire be serviced only when the circuit is de-energized.

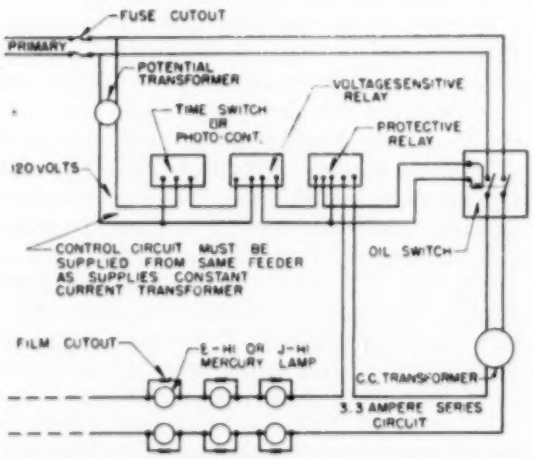

Figure 1. Connection of the component parts of a straight series system to operate E-H1 mercury lamps.

AUTHORS: Westinghouse Electric Corp., Cleveland, Ohio.

2. Variations in line voltage, with some types of constant current regulators, can cause variations in lamp wattage in excess of the recommendations for normal lamp lumens, life, and lumen maintenance.
3. System voltage interruptions of over three-quarter cycle in duration will cause a light outage of from 7 to 8 minutes in duration.
4. Under certain circuit conditions a power interruption of from 1½ to 5 cycles of duration can cause film cutout failure without damage to the lamps and create a maintenance problem on the circuit.

The conclusion drawn is that while the operation of mercury lamps on series circuits presents certain possible operating and maintenance problems it is possible, if the characteristics of all components of the system are well co-ordinated, to obtain satisfactory operation. Poorly designed or poorly applied systems are a potential source of operating difficulties which could more than offset the initial savings of such systems. It is considered that the acceptance and usage of straight series systems will increase during the coming years, but this is not to imply that such operation will supersede entirely, or even to a large extent, the use of 6.6-ampere, 20-ampere, or multiple distribution systems for street lighting, since straight series systems have certain inherent problems which will make them unacceptable to some utilities and municipalities.

Outdoor Decorative Lighting Techniques

R. A. Eshelby

THIS PAPER describes the use of light and color applied with imagination and ingenuity to create decorative effects ranging from a simple dignified treatment to exciting and fantastic themes.

There is no field in the application of illuminating engineering which offers so wide a scope or is so rewarding as the field of outdoor decorative lighting. The secret of success lies in the ability to temper the basic engineering principles with an appreciation of the "Artistry of Lighting," the faculty of devising something new, something exciting to the eye and stimulating to the observer.

It is essential that the lighting engineer and the artist or designer work in the closest harmony right from the inception of the project to ensure that the effect is attractive by day, yet enhanced during the hours of darkness by the use of light.

Prime factors to be considered include the shape or form of the subject, its physical dimensions, location and environment, the color of the subject and the nature of the material. Care must be taken to ensure the correct angular relationships between light sources and the objects illuminated and variations in intensities, color and shade to obtain correct perspective.

Fortunately the prosaic results so often produced by standard white floodlighting no longer represent the most economical and convenient form of revealing a subject by night; neither does the expensive use of color screens represent the only means of dramatizing such objectives.

The simplest form of decorative lighting — bare lamps or festoon strips — standard floodlights, the natural color of discharge sources and new translucent plastic devices represent the basic mediums from which the artist and the lighting engineer may create a symphony of light and color to reveal or transform almost any subject worthy of consideration.

Electric discharge sources because of their high lumen per watt efficiency form an economical means of color floodlighting. Color effects include the greenish-blue color of mercury, the monochromatic yellow of sodium, red from a 400-watt

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Figure 1. City of Blackpool, England features an annual "Illuminations Program" during the Fall months, attracting an average of three million visitors, extending its season several months past its normal summer holiday period. Shown at left is the 520-foot tower using 10,000 10-watt lamps, and the illuminated arch with changing color sequence.

4-foot neon source and from two 250-watt 4-foot mercury lamps light green and dark blue. The use of such lamps for lighting old buildings is appropriate as the color may enhance any defects or the natural discoloration of the masonry rather than emphasize them as is so often the case with white light.

Chrysaline is a new application of a plastic material which may be sprayed upon a form of almost any shape. The material forms a hard weatherproof translucent shell which may be illuminated from within and color effects are produced by treating the material with lacquer or the use of colored lamps. Such devices are invaluable when used in conjunction with bare lamps to create attractive displays and designs on the face of buildings unsuitable for standard floodlighting applications. They may also be used as illuminated motifs of a specific design appropriate to any occasion or event.

Festoon lighting has been misapplied so often in the past that few people will consider its use today. However, together with the use of other features it is often the only suitable medium for the effective treatment of open-type structures such as towers and bridges. Their application extends also to parks and gardens and in some cases to public thoroughfares. Correctly applied festoon lighting can produce most interesting and dramatic effects.

Any extensive program and particularly those designed as a tourist attraction should include static or animated "set pieces" or tableaux. The scope of design for such units is very extensive and no hard and fast rules apply.

Suitable basic themes are varied; they may be topical, artistic, classical or humorous. Topical subjects, however, soon date; historical events may be appropriate for festivals and specific festive celebrations.

Considerable thought must be given to the size and shape of such features particularly for spacious gardens or large open boardwalks otherwise they may be dwarfed by the surroundings. Creative ideas and drawing board impressions must be carefully checked and visualized with site conditions. Frequently, the units need to be considerably larger than at first visualized and careful thought should be given at the design stage to eliminate an unbalanced effect and costly modifications at a later date.

Invariably light must be integrated with the use of drapes, bunting, garlands, structural elements and any other artificial decorative media. It must also be used to the greatest advantage to enrich natural scenic beauty, gems of architecture and specific permanent features.

Whatever the nature or size of the program, it is most essential that the basic design be in good taste because such features inevitably result in extensive publicity, intended or otherwise, and the reputation of the community concerned will benefit or suffer as a result.

If the program is to be extensive, its success will depend to a large extent upon the cooperation of all interests in the community, business, social and religious groups, catering entertainment, transportation, etc. It is essential that the planning of the project coordinates all points of view.

Left to right:

W. Earle Hawkins

W. S. Till

D. W. Rowten

The Diamond Jubilee of 1954 And Its Effect on Street Lighting of Tomorrow

VERY FEW activities sponsored by a group similar to the Street and Highway Lighting Committee of the Illuminating Engineering Society have attracted the spontaneous cooperation of presidents, civic groups, parents, and teachers, as has this program for reducing nighttime traffic accidents by providing adequate roadway lighting.

Through the process of evolution many theoretical ideas have been explored and the practical applications recorded in the American Standard Practice for Street and Highway Lighting.

Many new lighting tools and techniques now considered commonplace were first introduced at a national celebration such as a World Fair, Exposition, or Jubilee.

(a) The use of alternating current for lighting was introduced at the World's Columbian Exposition (1893) in Chicago. We may credit the exposition as being responsible for the first mass use of decorative electric lighting, including external floodlighting of buildings and the embryonic beginning of multiple incandescent street lighting.

(b) The Panama Pacific International Exposition (1915) at San Francisco was noted for the decorative treatment of street lighting poles. Fairly high wattage incandescent lamps were used behind yellowish tinted globes. Market Street was referred to as the "path of gold." Perhaps this helped pave the way for the acceptance of sodium lighting, which later became familiar on the West Coast.

(c) There was a gradual transformation in street lighting practices from carbon arcs and Welsbach gas mantles to low wattage multiple incandescent lamps probably reaching its greatest acceptance about the time of the Sesqui-Centennial (Liberty Bell Celebration, 1926) in Philadelphia.

(d) The application of refractors and prisms in conjunction with fairly large single ornamental lanterns was emphasized during the celebration of "Light's Golden Jubilee" (1929). Series incandescent street lighting was becoming well established at this time also.

(e) The 400-watt A-H1 mercury lamp was introduced for industrial lighting in this country at the "Century of Progress" celebration (1933) at Chicago. Certainly the effect of the Fair at Chicago stimulated and made possible the relighting of State Street which was the first ornamental street lighting application of incandescent lamps rated at over one kw.

(f) The World's Fairs at San Francisco and New York (1939-1940) introduced fluorescent lighting in this country for commercial and industrial applications. It was also used for spectacular decorative effects. Improved mercury lighting was used extensively for special floodlighting effects and for fountain displays. Treasure Island at San Francisco featured the use of colored fluorescent displays and the San Francisco Bay Bridge is remembered for its sodium lighting.

We cannot dispute that these great and momentous occasions of the past have had their influence on street lighting development and practices.

It is only natural then, that remembering the past, we anticipate that something new and revolutionary would be unveiled at this Diamond Jubilee Celebration. As a background for this announcement, it is fitting that we review the foresight and planning that preceded this celebration.

We in the lighting industry are indeed fortunate when we have as associates, individuals of the

AUTHORS: Atlantic City Electric Co., Atlantic City, N. J.; Westinghouse Electric Corp., Bloomfield, N. J., and Cleveland, Ohio, respectively.

Figure 1. The second street to be modernized.

stature that comprise the management of the Atlantic City Electric Company of New Jersey. We are doubly fortunate when we have city officials and engineers with enthusiastic interest in improving street lighting.

About five years ago, those in charge at City Hall and the management of the Atlantic City Electric Company decided to improve the street lighting in Atlantic City. They had in mind a plan that would increase property values, encourage civic pride, reduce accidents, and contain all the other intangible benefits of good street lighting.

Proof that their general plan has prospered is evidenced by one illustration, Fig. 1, showing the improvements made in one of the business streets.

The orderly sequence of the overall lighting modernization plan was interrupted by the necessity of doing something out standing for the Boardwalk in anticipation of the Diamond Jubilee Celebration, and particularly the 100th Anniversary of the founding of the city, which would attract many conventions to Atlantic City in 1954.

A committee composed of the management of the Atlantic City Electric Company, city officials and representatives of the Boardwalk Association decided on eight basic requirements:

1. Average *maintained* illumination of 2.0 footcandles minimum — which at once implied a source of at least 30,000 lumens initial output;

2. Yet with wider spacing of standards than at present — to lessen "picket fence" effect;

3. And with in-built provisions for future increase to 3-plus footcandles without major changes to the system;

4. Illumination of color suited to the application — a wide pedestrian promenade with extraneous (color-correcting) light available, for the most part, only from the side opposite the luminaires;

LUMINAIRE EVALUATION CHART.

Luminaire (Fixture with Lamp)	Project Requirements								Final Rating
	(1) "2.0 fc Maintained"	(2) "Wider Spacing"	(3) "Expansion"	(4) "Suitable Color"	(5) "Maintenance"	(6) "Windage"	(7) "Progress"	(8) "Comparable Cost"	
Incandescent	No*	No*	No	Yes	Yes	Yes	No	No*	37½%
Sodium Vapor	No*	No*	No	No	Yes†	Yes†	No	No*	25%
Fluorescent	No*	No*	No	Yes	No*	No	Yes	No	25%
Mercury Vapor	Yes	Yes	Yes	No	Yes	Yes	No	Yes	75%
Fluorescent Mercury	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	100%

*Either lamp or fixture not available, feasible, or economical.

†If closed type.

NOTE: In ordinary business and traffic street lighting, higher lamp efficiency, higher utilization and more favorable cost of "straight" mercury vapor would normally outweigh requirements #4 and #7.

5. Rugged, non-corrosive equipment — for minimum maintenance in spite of continuous exposure to salt atmosphere;

6. Equipment of low windage — to withstand storms of gale, or even hurricane force;

7. A finished system epitomizing 75 years of progress in the lighting art,

8. And at comparable first cost.

The years of planning offered continuous opportunity for evaluation of all available light sources

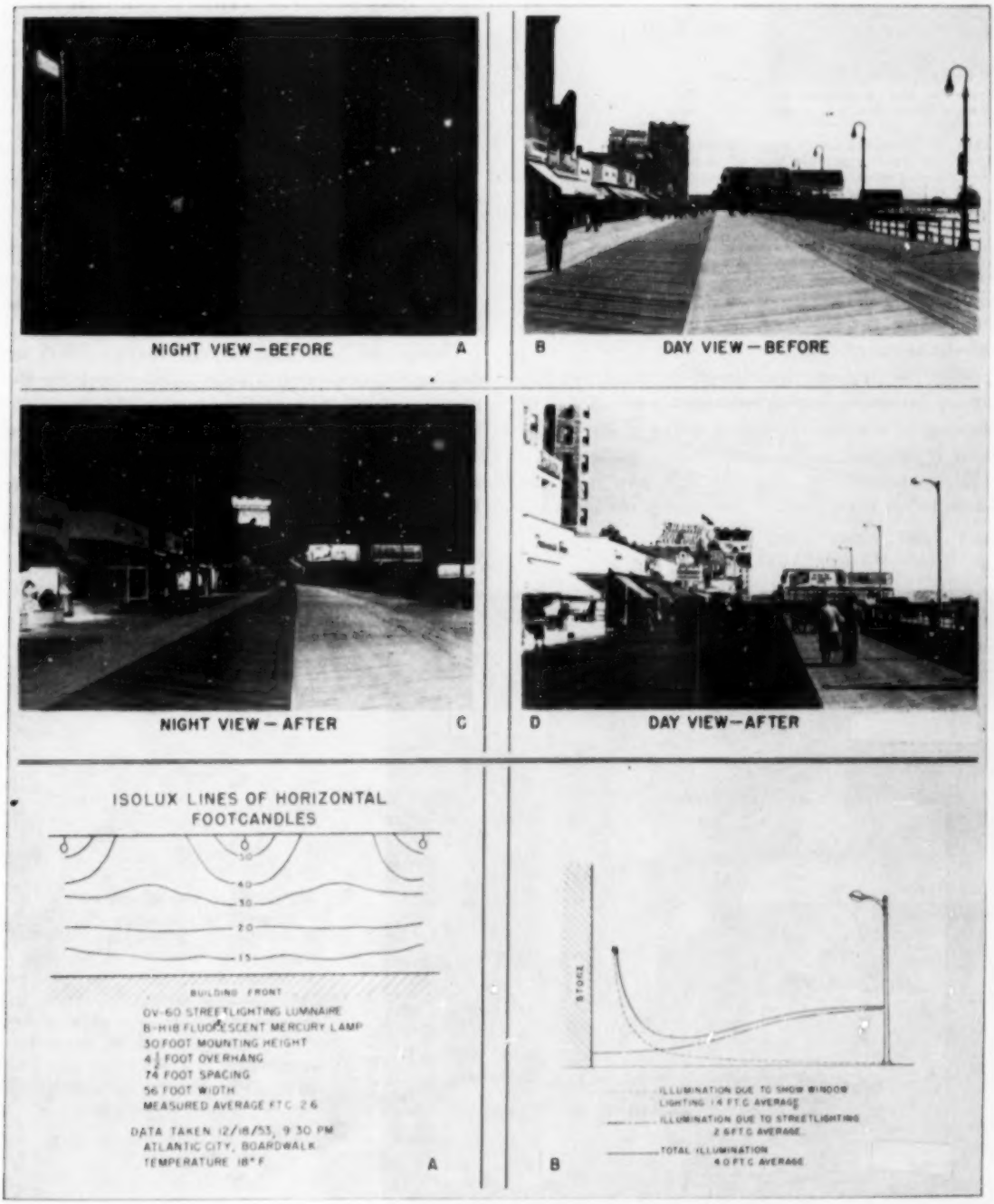

Figure 2. (Above) Before and after relighting illustrations.

Figure 3. (Below) Measured lighting results.

SUMMARY OF INSTALLATION DATA

Traffic Volume (Pedestrian Only)	The Old (by ASA-IES Types)		The New (by Avenue Locations)		
	Type IV Very Heavy and Heavy	Type V Heavy and Medium	New Jersey to Bellevue Very Heavy	Bellevue to Morris Heavy	New Jersey to Massachusetts Medium
Width of Walk (Feet)	40 & 60	60	60	40	60
Luminaire	Pendent	Post-Top	OV60-IV	*OV20-II	*OV20-II
Lamp	575 W	575 W	B-H18	J-H1	J-H1
Rated Initial Output (Lumens)	10,000	10,000	33,000	19,000	19,000
Mean Lumens Over Life	9,160	9,160	26,400	15,000	15,000
Luminaire Depreciation Factor	.60	.80	**.90	**.90	**.90
Height to Light Center (Feet)	18.5	19	30	24	24
Overhang (Feet)	1.5	None	4.5	3	3
Linear Distance (Feet)	†6,900	2,000	†6,480	1,520	900
No. of Luminaires	105	35	88	20	11
Average Spacing (Feet)	65.5	57	73.6	76	82
Total Utilization Factor	.38	.17	.39	.44	.475
Horizontal Avg. Maintained Ft-c.	.53	.36	2.1	1.95	1.3
Average Initial Ft-c†	———	———	2.92	2.75	1.84

*Type IV distribution results when J-H1 lamp is used.
**Based on 3-year experience with OV20-E-H1 installation in less favorable atmospheric situation.
†Not including areas requiring special treatment: viz, Steel Pier, Central Pier, Convention Hall.

and luminaires against these conditions. A choice was offered between the conventional filament source, the yellow sodium light, the standard mercury source, the tubular fluorescent and a new fluorescent mercury unit.

With the project requirements in mind, the following luminaire evaluation chart was helpful in showing at a glance the points rating of the equipment considered.

A comparison of the old and new may be examined in Figs. 2 and 3. Because of the identical exposure and printing, these night photographs afford accurate direct comparisons.

A tabulated comparison of the installation data is available in the table above.

Those who have had a part in this Diamond Jubilee Celebration will look with interest for the permanent influence of the occasion. In the years to come we will reflect on our experiences and remember the theme of the Absecon Beacon, Fig. 4, and "The String of Diamonds in the Sky," the Boardwalk lighting of 1954.

Figure 4. A beacon and a diamond to remember.

Electric Discharge Lamps in Street Lighting Service

J. W. Young

ELECTRIC discharge light sources although presenting factors in application and operation not involved with the filament lamp are well adaptable to street lighting and moreover possess certain distinctive light production assets not readily available with the incandescent type.

Sodium and mercury lamps were introduced around 1933; recently some real effort has been directed to fluorescent lamp application in street lighting. All three sources are high efficiency types, generating two to three times the lumens per watt of incandescent and capable of a long useful life in service. The sodium and mercury lamp color characteristics give rise to special considerations.

In the present-day evaluation of light source development, two lamps stand out: the mercury lamp possesses potentials in development that are highly challenging to the lamp designer; fluorescent lamps merit intensive study and trial.

Mercury Lamps — Installations in the country have been reported recently as in excess of 250,000 lamps and continuing under steady expansion. Refinements in lamp design are progressing and fabrication techniques are producing a more uniform product. Pioneering is under way with the larger wattage sizes and small wattage lamps are under trial. High lamp efficiency offers an opportunity to upgrade lamp sizes in lighting systems

AUTHOR: Lighting Engineer, New England Power Service Co., Boston, Mass.

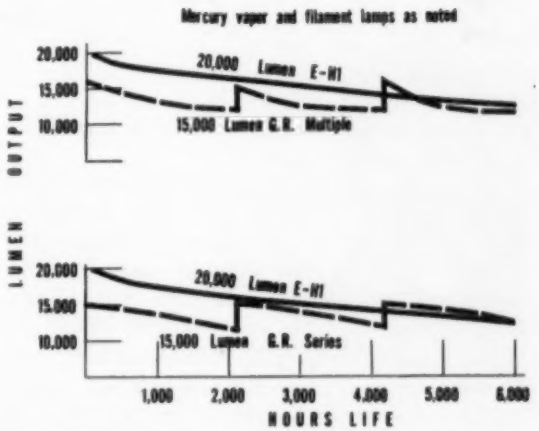

Figure 2. Comparison of average lumen maintenance. Lamp lumen values taken as follows: Mercury: mean lumens, 16,200, 6000-hour burning interval. Incandescent: G.R. Multiple — mean lumens, 13,000 on 3000-hour rated life, 2100-hour burning interval. G.R. Series — mean lumens, 13,250 on 3000-hour rated life, 2100-hour burning interval.

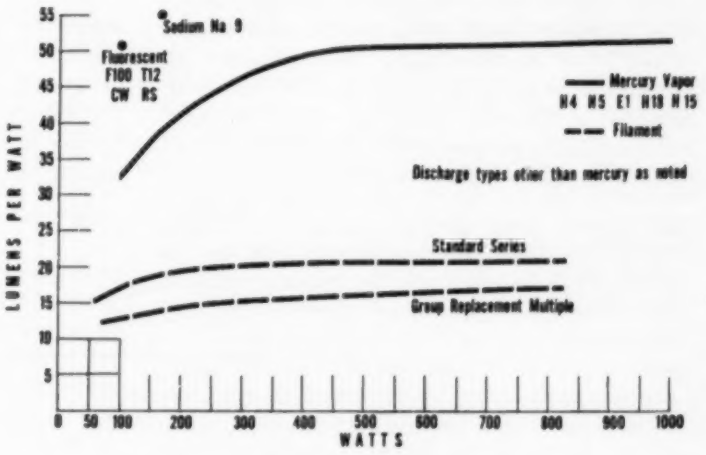

Figure 1. Illustrating lamp efficiency as a function of lamp watts — commercially used street light lamps. In this comparison, filament lamp types were selected to show the widest possible range of filament lamp efficiencies; their relationship is not intended to indicate any advantage of either type over the other.

Figure 3. Nominal lamp sizes (initial) lumens). Filament lamp sizes are those listed in the E.E.I.-N.E.M.A. Standards for Filament Lamps used in Street and Highway Lighting, E.E.I. Pub. No. TDJ-131; N.E.M.A. Pub. No. 118-1951 January 1951.

and to furnish substantial increases in lumens for a moderate wattage input.

Recent equipment development includes a ballast that provides rated watts (and light output) to the lamp when burning horizontally and a type of regulator that provides constant current to the secondary under a rather wide range of input voltage.

Fluorescent Lamps — The fluorescent lamp with its low brightness properties is a new and unique application in street lighting in this country. Its performance is much like mercury sources; however, application involves the effect of external ambient temperatures of light output of the luminaire. The bright pavement patterns on the road surface facilitate silhouette seeing and are particularly effective under wet pavement conditions. The claims for effectiveness suggest that new techniques are needed that remove the subjective element in evaluating lighting as much as possible.

The color attribute is a factor in application, with phosphor coated types contributing to the versatility of mercury lamps, the fluorescent, of pleasing color, producing a crisp white light that provides a favorable rendition of colors, and sodium with its familiar yellow cast, serving in instances as cautionary illumination.

TABLE I.—Lamp Designations and Initial Lumen Output for Lamps Recommended for Street Lighting Service.

Lamp Watts	Lamp Designation	Initial Lumens Vertical Burning Position
	Clear Mercury	
1000	H1000 — A15 or AH15	52,000-55,000
700	— AH18	35,000
700	*H1000 — A15	35,000
400	H400 — E1 or EH1	20,000
400	H400 — A1 or AH1	15,000
250	{H250 — A5 or AH5} {H250 — C5 or CH5}	11,000
100	H100 — A4 or AH4	3,300
100	K100 — K4 or KH4	3,300
	Fluorescent Mercury	
1000	H1000 — C15 —	46,000
1000	— BH15	49,000
700	*H1000 — C15 —	31,500
700	— BH18	33,000
400	H400 — J1 or JH1	17,000-19,000

*Operating on a ballast furnishing 700 watts to the lamp.

Experience with vapor lamps indicates their suitability for public way lighting, affording marked economic advantages and adaptable to luminaire design that furnished improved visibility and comfortable seeing. The industry needs more comprehensive field service data on lamp operation and greater uniformity of product.

Abstracts of papers
pertaining to

Interior Lighting

The Interior Designer Looks at Lighting

C. Eugene Stephenson

THREE SPECIFIC points are outlined in this paper:

1. The importance of good and proper lighting to the interior designer-decorator.
   (a) Efficiently, with view to design and decor.
   (b) Emotionally.
   (c) Aesthetically.
   (d) Creatively.
2. The necessity for greater collaboration and understanding of mutual problems by the illuminating engineer and the interior designer-decorator.
   (a) Color and its proper illumination, etc.
   (b) The difference between commercial and private decoration problems.
   (c) The possibilities for better home lighting.
3. The need for better design and new design in portable lighting fixtures and standard lighting fixtures and techniques.
   (a) Correlated lamps for room use.
   (b) Improved lighting units.
   (c) More flexible systems of home lighting.

To the interior designer the lighting must succeed in three different ways:

1. Effectively — Effective lighting is that which does the job best, measured by standards recognized and proven. It must interpret the room as well after dark as during the day; when daylight or streaming sunshine defines its composition, softens or sharpens its shadows.

2. Emotionally and aesthetically — Many laymen probably do not think of applying the word "Emotional" to a lighting design. But to designers, lighting must function from this standpoint too. For instance, some schemes call for a bold, direct means of illumination. Others depend for their result upon soft translucence or suggested light, understated. In my own recipes of successful decoration, I have used what I sometimes refer to as "mood lights." These are usually nothing more than contrived effects based calculatingly upon a sense of the dramatic, nostalgic, or "atmosphere." To cite an example, I once used in a traditional room a pair of old oil lamps converted and electrified, with 7-watt lamps glowing through opalescent, spherical globes. They were not functional in the sense of providing "light" but mood was established to a great degree by the soft light of a simulated era of the past, which the client associated with the lighting effect.

3. Creatively — As designers work with new materials, so they also can and should work and plan with new types and formulas of creative light and lighting. Interior designers should extend their creative thinking into the realm of light control. Creative lighting is not necessarily a one-man job; the desired result is usually based upon some well planned scheme (by the designer) which of necessity must be understood by the collaborating technician to result in a successful job. If more designers realized that the experience of capable

AUTHOR: National President, American Institute of Decorators, New York, N. Y.

lighting specialists was available to aid them with the practical aspects of their plans, perhaps more would be inclined to avail themselves of such advice. The services of a qualified lighting specialist should be considered as a normal element of cost, and be made a part of the design fee.

Both groups, the interior designer and the lighting specialist, are creative, vital forces which need to understand each other better. The designer should have no fear that his "composition" will no longer be his own creation of harmony and rhythms if technical collaboration is used. He should realize that by taking advantage of the help of the technician he can increase the importance of his "chamber music" to that of a "symphony." Continuing the musical analogy, better "orchestration" in the form of the lighting specialist playing up the good points, can make just that difference.

The interior designer too has problems which should be understood by the lighting specialist. Rooms which have been created to have certain color values and effects, for instance, must retain this value. Warm or cool color schemes can be accentuated by the proper use of light, but the designer's idea must be understood.

In many commercial interiors, stores, shops, hotels, etc., rooms — although well lighted — could gain considerably in their final appearance, if the lighting specialist would collaborate with the designer. With such collaboration the obvious and stereotyped is avoided, and a much better result obtained.

It is quite possible that new types of lighting equipment and lighting techniques could result from a better understanding between these two professions.

Left to right:

W. H. Johnson

W. H. Kahler

D. W. Rowten

Economics of Mercury Lighting For Industrial Areas

MERCURY lighting is now being used extensively in industry because of its many favorable characteristics. The economics, electrical and illumination characteristics of mercury lighting, however, are different from other sources. Therefore, this paper has been prepared to provide guideposts for the lighting system designer.

Economic Analyses — This paper includes a comprehensive economic study of mercury lighting in a typical high bay industrial area. These initial costs of the various systems are computed on actual wiring layouts for each system. The economics of various size branch circuits are studied, as well as the economics of 120-, 265-, and 460-volt supplies to the various systems.

Fig. 1 summarizes the annual economics of various mercury lighting systems versus incandescent and fluorescent systems. All systems are based on 20-ampere circuits because the circuit cost analysis indicated 20-ampere circuits to be more economical than 50-ampere circuits.

The color problem of mercury lighting is completely discussed with the principal "do's" and "don't" explained. The economics are analyzed of straight mercury, color-corrected mercury, combination mercury-incandescent systems. The analysis indicates that color-corrected mercury sources are more economical than combination systems.

AUTHORS: Westinghouse Electric Corp., Cleveland, Ohio.

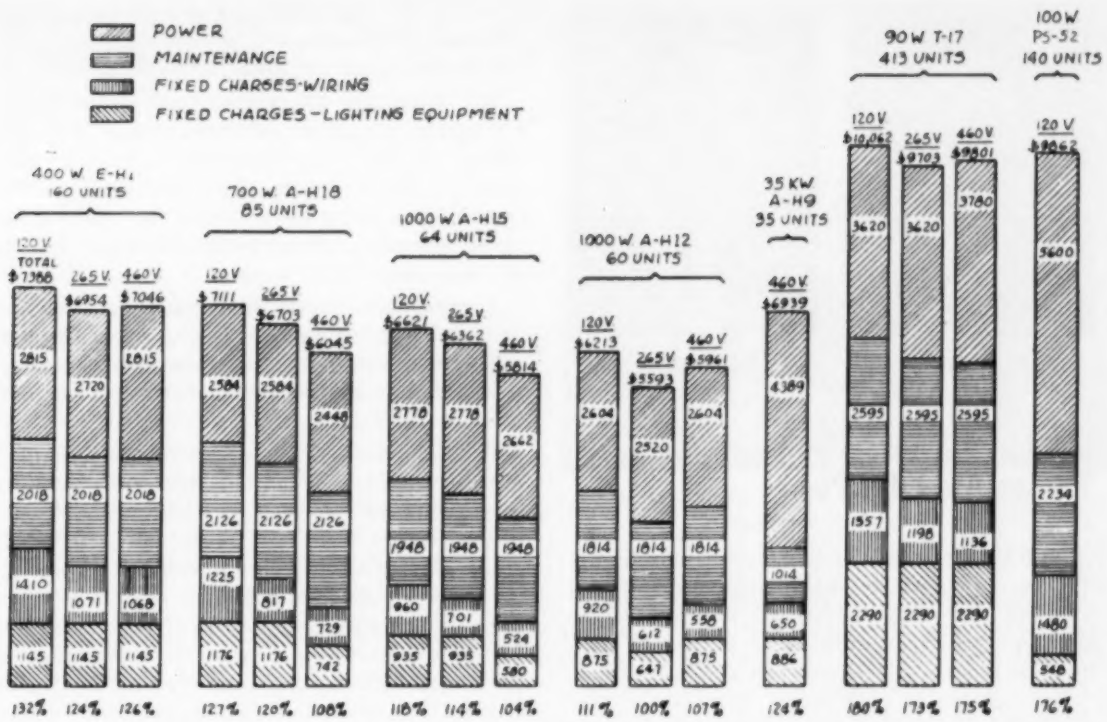

Figure 1. Cost of lighting analysis — industrial plant, 30,000 square feet, 40-foot mounting height, 50 footcandles, 4000 burning hours per year, energy rate $.01/kwh for fixed charges, branch circuits 20 amperes each.

Electrical Characteristics — Like all vapor lamp sources, the mercury lamp requires some type of ballast to limit the operating current and the high reactance of this ballast results in a low power factor. Therefore, practically all ballasts used with mercury lamps are provided with a capacitor to correct the power factor to over 90 per cent. There are various types of ballast circuits and these have different effects on the design of the distribution system and the economy of the system. Ballasts commonly used in industry are the high reactance auto-transformers, simple reactors, or two-lamp types designed on the lead-lag principle. Where adequate line voltage is available for starting, the reactor type is the most economical ballast. Practical applications of reactor type ballasts are 1000-watt A-H12 lamps on 265-volt circuits and 1000-watt A-H15 lamps on 460-volt circuits.

The starting and open circuit currents of certain mercury ballasts are higher than normal operating currents and circuit protective devices must be selected accordingly. A table is included in the paper indicating the allowable number of mercury lamps per circuit for the various types of ballasts and for line voltages of 120, 265 and 460.

Mercury Lighting for the Future — The basic features of mercury lighting as illustrated in this paper are low initial cost, low overall cost, minimum maintenance, and adaptability to higher distribution voltages. Therefore, we can expect extended use of mercury lighting in industry, particularly for the higher levels of illumination. We may also expect mercury lighting to make inroads in commercial lighting applications.

One objection to mercury lighting for medium mounting heights is the possibility of direct glare. The comfort could, however, be improved by new luminaire designs which provide an upward component and better shielding. An upward component would be most useful where the luminaire and ceiling are within the normal field of view.

If the past experience is any indication of things to come, even greater economies can be expected for mercury lighting. The results will be lower cost of lighting per footcandle, a factor that always leads to trends to higher illumination levels and better quality. There are still many new developments to come in mercury lamps, luminaires, and ballasts.

R. M. Smart

Willard Allphin

Lighting for Visual Performance in a TV Set Assembly Plant

THE BASIC AIMS of this project were to provide a comfortable visual environment, to give interiors a pleasing appearance, to permit maximum productivity consistent with the cost of lighting, and to keep production costs at a minimum.

The last aim is particularly important on the assembly lines, because a defective chassis cannot be economically scrapped. The faulty connection, ground or short circuit must be located and repaired at considerable expense in time and effort.

Most of the lighting arrangements follow the methods outlined in the American Standard Practice of Industrial Lighting, but a separate study was made of the assembly line problem and a special luminaire was designed for its solution.

The visual task differs from those of fine assembly work in most other industries because it is seen against an immediate background of the bright, cadmium-plated chassis. The surface is rather specular and, being tilted toward the operator for ease of assembly, reflects somewhat diffused images of the overhead light sources.

The luminaire in the illustration was designed to spread areas of reflected brightness on the cadmium-plated surface of the chassis, in order to keep this brightness as low as is consistent with a high illumination level.

The luminaire consists of two continuous rows of dual 90-watt open end industrial units mounted side by side and shielded by a continuous row of 32-inch square sections of white diffusing corrugated vinyl plastic. Corrugations are normal to the lamps for greatest brightness uniformity. The shielding is mounted approximately two inches below the reflectors and 54 inches above the center of the average chassis, and centered above the chassis centers. The module sections are mounted so that any one section can be lifted and slid over an adjacent section for lamp maintenance, or the panels can be removed readily for cleaning.

AUTHORS: Sylvania Electric Products Inc., Cleveland, Ohio and Salem, Mass.

TABLE I.

	Old	New
A—Horizontal illumination	36	240 Ft-c
B—Vertical illumination	5.5	74 Ft-c
Ratio *A:B*	6.5:1	3.3:1
C—Illumination at angle of chassis	30	228 Ft-c
D—Brightest reflection in chassis	200	195 Ft-L
E—Darkest area of chassis	10	55 Ft-L
Ratio *D:E*	20:1	3.6:1
Ratio *D:C*	6.7:1	0.9:1

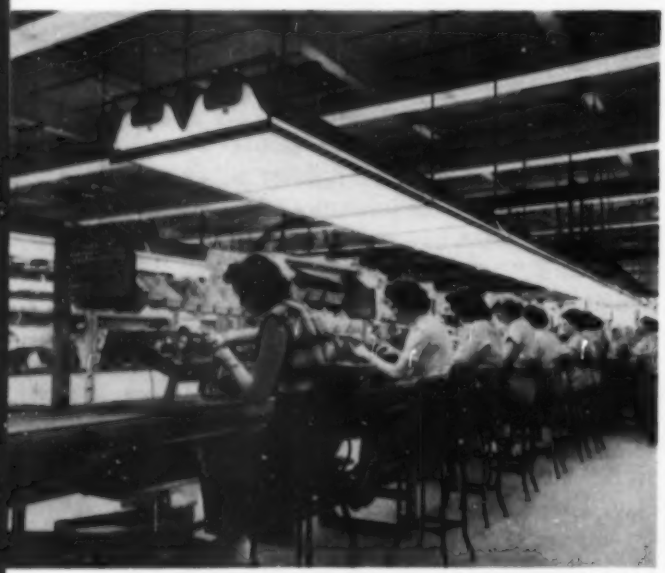

Figure 1. An assembly line in the Batavia plant.

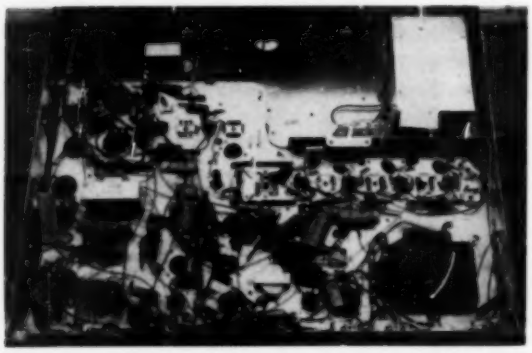

Figure 2. TV chassis under the new lighting.

Light and Color Engineering In Post Offices

By Tom C. Cargill, Jr.
Curtis E. Kautt

THE Post Office Department is Big Business. In its 40,000 post offices, it handles over 50 billion pieces of mail matter annually. This is a tremendous *seeing* job as it is necessary to read the addresses on each piece of mail five or more times to properly route it to the addressee. In the past 15 years, mail volume has increased 92 per cent while postal employment has increased about 60 per cent. These increases in volume and manpower seriously overcrowded existing buildings and, with no adequate modernization program, resulted in a serious deterioration of working conditions. In 1950, faced with problems of deteriorating working conditions, high employee turnover, inadequate space and increasing volume, the Post Office Department made a new approach to alleviate conditions through a program of improved work environment.

An experimental installation of improved illumination, color and ventilation was made at the Richmond, Virginia post office. Prior to renovation, the general lighting system provided an average of 8 footcandles of illumination supplemented by goose neck lamps at the working positions. This, together with dark walls and furniture, resulted in a working environment far below modern standards. In the new installation, several types of fluorescent fixtures were used. A four-foot two and four-lamp general diffusion fixture with louvers, using T12 40-watt lamps was selected as best suited for postal use.

As good lighting alone will not provide good seeing and working conditions, paints of selective colors with proper reflective surfaces and good performance were used. Ceilings and beams were painted white, upper walls light green and dado medium green. Workroom furniture was refinished in medium green with pigeon holes outlined in light buff. Desks and other furniture in clerical offices were refinished in gray with light linoleum tops.

To improve ventilation six 48-inch exhaust fans were installed. Theoretically, this provided an air change in the ventilated area in less than five minutes and reduced the oppressiveness of stale, humid air and removed considerable dust from the workroom.

AUTHORS: Post Office Dept., Washington, D. C.

Improved lighting in post office permits functional arrangement of furniture.

The result of this experiment dollarwise is very significant. The total cost of lighting, painting, ventilating the 24,000 sq. ft. on the first floor at Richmond amounted to $34,714.65, or a cost of $1.36 per sq. ft. Using an amortization period of 10 years for fluorescent fixtures and installation costs, and five years for painting, linoleum work and ventilation, the cost prorated per employee benefits is $23.15 a year. Based on 1000 units of production per man-hour in 1951 at the time the renovation started, production increased to 1002 in January 1952 and to 1080 in January 1953. This is an 8 per cent increase over the 1951 base. As the average annual salary of postal employees is approximately $4,000 it can be seen that an 8 per cent increase in productivity will repay the cost of improvements in a very short time.

The result of the Richmond experiment, together with experiments conducted at St. Paul, Minnesota, Philadelphia, Pennsylvania and Rockville, Maryland, resulted in refinements of the lighting technique and the development of general specifications for environmental improvement of Post Office quarters.

Seeing and working conditions in practically all the larger post office branches and stations are considerably below present day standards and the Department is making every effort to extend the modernization program as rapidly as funds permit. This is a large undertaking and will take a number of years to accomplish. However, it has been demonstrated that the basic standards so far developed will provide an improved work environment that will be beneficial to both the employees and the Post Office Department.

Display of rendus submitted by students in solving design problems emphasizing the lighting of a small home. The display is two-sided.

Twelve Solutions of a Home Lighting Problem

Laurence Schmeckebier

George Danforth

Karl A. Staley

THIS PAPER was written by an art director, an architect, and an illuminating engineer. They represent the Cleveland groups of the A.I.A., the I.E.S., and the S.I.D. (the last-named being the Society of Industrial Designers).

A general committee organized and conducted an annual competition of teams of students from three schools, Case Institute of Technology, Western Reserve University School of Architecture, and the Cleveland Institute of Art. Thus groups of artists, architects, and engineers are brought together and the student teams are assisted each year in solving problems of design emphasizing lighting.

In this year (1953), a small home was the subject of the program. Twelve groups of drawings were submitted in the contest, details of which are given in the paper. In an illustrated analysis of the solutions offered by the competing students, highlights of the prize-winning rendus are discussed. Outstanding contributions in design, architecture, and lighting are featured.

The A.I.A.-I.E.S.-S.I.D. competition has been going on for five years. The paper is the first national recognition of this far reaching new approach to the architect and designer by the Society. Through the Committee on Allied Arts of the Cleveland Section, and the newly-formed national sub-committee on Allied Arts, the activity is branching out. The paper should shed interesting light on why it has been so successful year after year. The student drawings will be on exhibit at the Convention.

AUTHORS: Director, Cleveland Institute of Art, Professor of Architecture, Western Reserve Univ., Application Engineering Div., General Electric Co., Nela Park, Cleveland, Ohio.

Abstracts of papers pertaining to

Light Sources and Calculations

Robert Swern Wiseman

Brightness and Illumination By Interreflections in Enclosures

THE PURPOSE of this research was to assimilate the ideas and concepts of enclosure theory in concrete form and to verify the results experimentally. The equations presented in this paper were developed from the most fundamental concepts and predict the illumination on horizontal planes (work surfaces) and the luminosities (brightness expressed in footlamberts) of the walls, ceiling and floor.

A six-foot cubical, white-translucent Plexiglas room was used as a model. The distance between the Plexiglas ceiling and plywood floor was varied between approximately three to six feet. The interior Plexiglas surfaces were sandblasted and were made luminous by using silver-bowl incandescent lamps in cavities behind the surfaces. Data were taken to obtain values for the room dimensions, reflection factors, initial and final surface luminosities, and illumination with the ceiling as the only source of light and then with the walls as the only source. Data were also obtained for the floor as the source by considering the room to be inverted with data taken accordingly.

The final luminosity and illumination values were calculated from the derived equations using basic data obtained from the model room. These calculated values were compared with the measured values, and as a result, it may be determined that the theoretical equations predict the final results with sufficient accuracy for most applications. To satisfy more exacting requirements, "correction factors" were calculated which when applied to the derived equations (or published interflectance factor method tables) reduce the variations between the calculated and measured values to less than five per cent for most comparisons of practical importance.

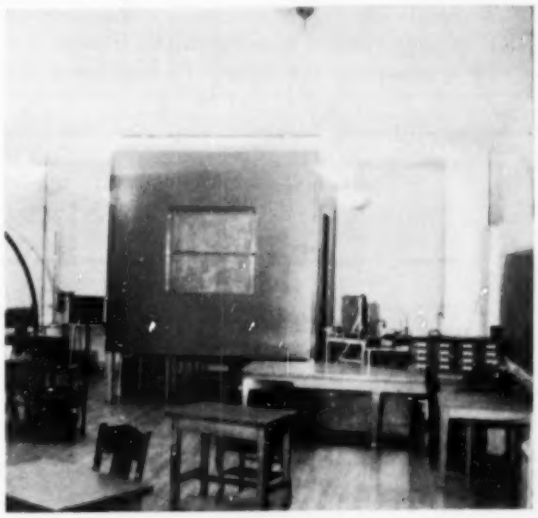

Figure 1. View of experimental room as seen from the South. Six-foot cubical Plexiglas room with movable floor enclosed by nine-foot-square plywood surfaces.

AUTHOR: Chief, Research and Photometric Section, Night Vision Equipment Branch, Electrical Engineering Department, Engineer Research and Development Laboratories, Fort Belvoir, Virginia.

Left to right:

J. W. Griffith

W. J. Arner

E. W. Conover

A Modified Lumen Method of Daylighting Design

THIS PAPER is a continuation and modification of a lumen method of daylighting design for predicting the illumination on the work plane of interiors. It permits the architect and illuminating engineer to study the various advantages of building designs, ceiling heights, and interior decoration and assists in designing a compatible artificial lighting installation.

The prediction technique shown in this paper employs coefficients of utilization based on the physical dimensions and decoration of a room for various sky and ground conditions. They were developed from several hundred tests including many of the daylighting variables ordinarily neglected in a theoretical approach of daylighting design.

The prediction method is simple to use and permits the development of a footcandle distribution graph as shown in the figure. In this figure the necessary footcandle values were computed to draw the curve for a unilateral window. Additional footcandle values were computed for a bilateral window in the opposite wall and plotted on the graph. The two curves were then added together to give a total distribution of illumination within the room from daylighting.

The results in the figure are for a room assumed to be 32 ft by 32 ft by 12 ft with a main window from wall to wall and extending from a 42-inch sill to the ceiling. It was further assumed that a 2-foot 9-inch bilateral window, at the ceiling, and extending from wall to wall was opposite the main window. The main window was assumed to be oriented north and interior reflectances were taken as: floor 30 per cent, walls 60 per cent, and ceiling 85 per cent. The total incident illumination on the north wall was taken as 500 footcandles with 300 from the sky and 200 from the ground. The total illumination incident on the south bilateral window was taken to be 572 footcandles.

These conditions are similar to a test run in the

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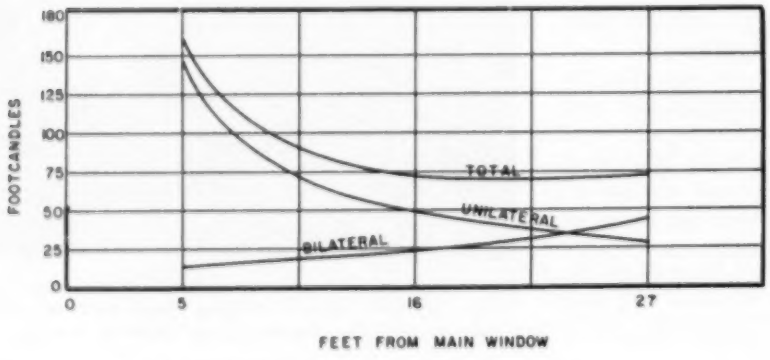

Figure 1. Footcandle distribution graph.

full size test house at Southern Methodist University on March 24, 1950. For the full size test there was an 8-foot reflector under the full length of the 2-foot 9-inch bilateral window on the south which we assumed produced a distribution pattern similar to that of a diffusing control. The measured values were 158 footcandles maximum, 73 footcandles mid-point, and 71 footcandles minimum. The predicted footcandle values are 158.4 maximum, 71.9 mid-point, and 72 minimum.

The scope of this method will be further extended with the development of curves covering horizontal louvers and overhangs for sun exposures. The authors are confident that with little additional experimentation the method can be extended to cover illumination on the other important surfaces of the room and so lead to a prediction of brightness ratios.

Wolfgang E. Thouret

George W. Gerung

Xenon Short Arc Lamps And Their Application

BECAUSE of the limited brightness of incandescent lamps for optical devices, there is a definite demand for light sources combining the high brightness of carbon arcs with the maintenance-free operation of filament lamps. Mercury and xenon short arc lamps, characterized by operation at high wattages per unit arc length up to 2 kw/mm and at high pressures up to 65 atmospheres, seem to be an answer to this problem. They have high luminous efficiencies and high brightness values that otherwise can be produced only by carbon arc lamps. It is their advantage, however, that they are perfectly clean in operation and that their arcs operate steadily without attention over a long life, as they are completely enclosed and hermetically sealed in a bulb.

Mercury short arc lamps have been developed since 1936[1-4] and have been available as special high brightness sources for many years. During the last war, Schulz[5,6] has shown that short arc lamps filled with krypton or xenon gas represent high brightness sources which have two important advantages over mercury short arc lamps: perfect color rendition as in natural sunlight and undelayed full light output after being switched on. The luminous efficiency of xenon short arc lamps and their brightness amount only to approximately 50 per cent of those of mercury lamps under equal conditions. However, considering the above advantages, these values are still high enough to justify great interest in the development of rare gas lamps for use in projectors, searchlights and other optical devices.

Therefore, confirming and extending the original

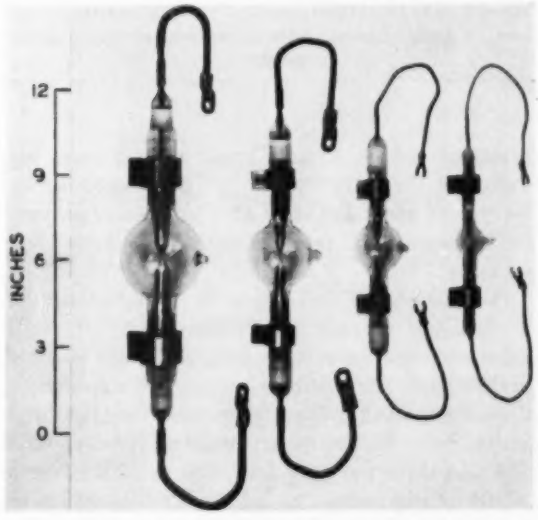

Figure 1. Four types of xenon short arc lamps for a-c operation. From left to right: 2000-, 1000-, 500- and 150-watt.

AUTHORS: Westinghouse Electric Company, Bloomfield, N. J.

TABLE I.—Approximate Operating Characteristics of Four Types of Xenon Short Arc Lamps for a-c Operation.

Wattage	150	500	1000	2000
Arc Voltage	20-24	16-22	16-22	16-22
Arc Current (Amps.)	7-9	25-32	50-64	100-125
Arc Length (Millimeters)	2-3	2.3-3.3	2.3-3.3	3-4
Arc Width at 10% of Axial Brightness (Millimeters)	1.6	2.6	3.0	4.2
Axial Brightness in Center Between Electrodes (cd/sq. mm)	70	150	250	250
Lumens (Initial)	—	11,000	22,000	32,000
Lumens per Watt	—	22	22	16
Bulb Diameter (Inches)	1	1⅝	2	2⅝
Maximum Overall Length (Inches)	6	9	12	13½
Operating Position	Vertical	Vertical	Vertical	Vertical

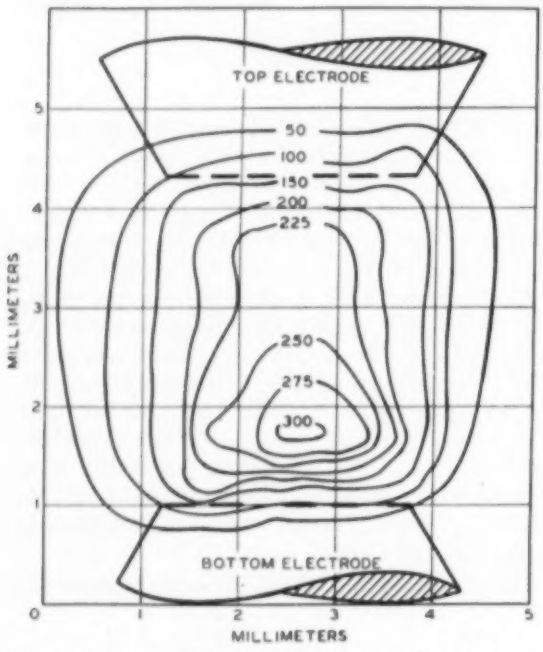

Figure 2. Arc brightness distribution of 2000-watt xenon short arc lamp. Contour lines in candles per square millimeter.

results of Schulz, several other authors have investigated the properties of arc discharges in the heavy rare gases and data of a number of experimental xenon high pressure lamp types have been published.[7-9]

The purpose of this paper is to report on the development of four new xenon short arc lamp types and to discuss their data and their possible applications. Fig. 1 shows the outward appearance of the lamps and Table I gives their electrical and optical data. The lamps are designed for a-c operation and their wattages from 150 to 2000 cover a relatively wide range in order to facilitate investigation of a great variety of applications.

The relatively low efficiency values are not representative of the maximum lumen output values that can be attained with xenon arcs. They result from the necessary compromise between source concentration and efficiency that is characteristic of the design of short arc lamps. The axial brightness values in the center between both electrodes can be considered to represent each lamp's brightness. They range between 70 and 250 candles per square millimeter. The source dimensions of the 2000-watt lamps are very close to circular or square shape as illustrated by Fig. 2. It shows a complete contour map of curves of equal brightness for this lamp.

The lamps can be operated from a standard 120-volt a-c supply and require, besides a series inductance or resistance ballast, a special high voltage pulse starting circuit as described by Freeman.[3]

The spectral energy distribution of the xenon lamps follows very closely to the spectral energy of the sun plus skylight in both the visible and ultraviolet region.

The advent of a line of xenon short arc lamps will offer the opportunity of extended investigation into numerous avenues of application in the fields of still and motion picture projection, searchlights, spot lights and back projectors for theatrical and television studio lighting, color matching, solaria and accelerated fading or aging tests.

It is believed that the basic properties and the wide field of possible useful applications of the xenon lamp will establish it as a significant new lighting tool and a lamp with a future.

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Left to right:

Erwin F. Lowry

W. Calvin Gungle

Charles W. Jerome

Some Problems Involved in the Design of Fluorescent Lamps

THE PERFORMANCE of a fluorescent lamp is determined by a number of lamp parameters such as bulb geometry, the kind and pressure of inert gas filling and lamp loading. External factors like ambient temperature and the type and quality of auxiliary equipment are also important. Much has been written regarding these matters but the situation has been far from static so a re-evaluation of at least some of these factors seems to be in order.

The longest feasible bulb length is desirable from an efficiency standpoint. This maximum length appears to be about 96 inches which will give about 90 per cent of the efficiency of a lamp of infinite length. From experimental results and theoretical considerations it turns out that the optimum bulb diameter is about 1.5 inches. (See Fig. 1.)

An inert gas filling is required to facilitate starting, protect the cathode from ion bombardment and to minimize barium vaporization. This gas filling, however, absorbs considerable amounts of energy by elastic collisions with electrons. The amount of this loss and consequently the lamp efficiency varies materially with the atomic weight, collision cross section and pressure of the fill gas. It is demonstrable that lamps filled with a low pressure (1.0 mm) of krypton or a mixture of

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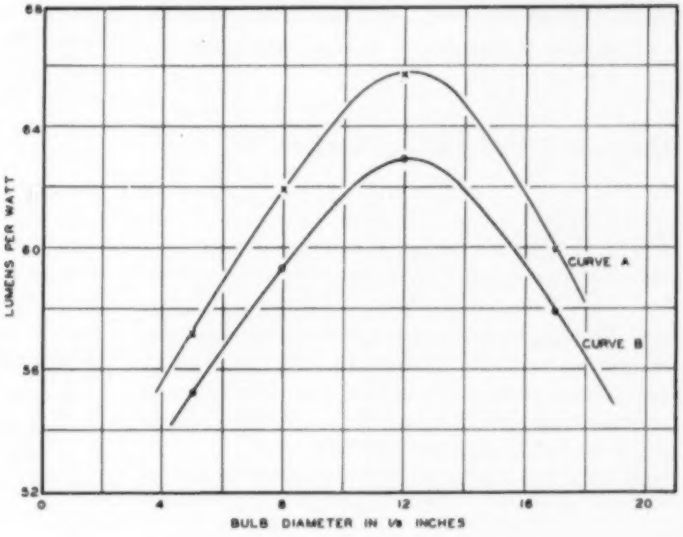

Figure 1. Effect of Bulb Diameter on Efficiency

Curve A — At maximum efficiency

Curve B — At rated loading

krypton and argon will have appreciably higher efficiencies than similar lamps filled to 3.0 mm of argon.

Improvements in cathode construction and the use of zirconia additions to the cathode coating result in a cathode which is extremely resistant to the erosive action of ion bombardment. More stable phosphors give good lumen maintenance even at low gas pressures and high lamp loadings. Fig. 2 presents a set of curves showing the efficiencies which may be expected at various loadings and various fill pressures by application of these principles to 96T12 cool white lamps.

The use of the rapid start principle of lamp operation is advantageous from the standpoint of overall efficiency. On the other hand, high ambient temperatures have a deleterious effect. With high loadings therefore it is essential that the lamps be operated in well ventilated fixtures.

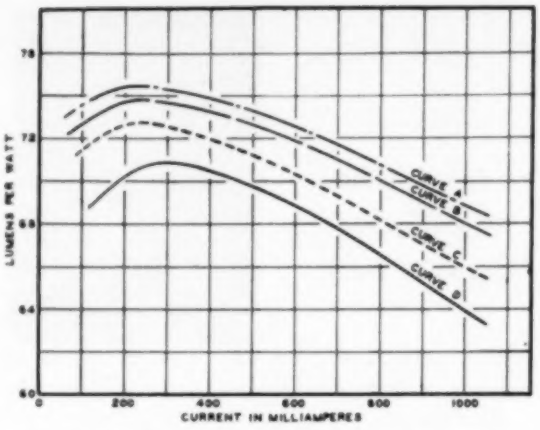

Figure 1. Efficiency vs Current — 96T12 lamps with 50 argon : 50 krypton fill.

Curve A — 1.0 mm pressure **Curve C — 2.0 mm pressure**
Curve B — 1.5 mm pressure **Curve D — 3.0 mm pressure**

Wentworth M. Potter

Anson H. Russell

Measured Utilization Factors II

ADDITIONAL measurements have been made to extend the range of utilization data presented by the authors in ILLUMINATING ENGINEERING (page 137, March 1954). These tests included both filament and fluorescent luminaires, the latter in continuous rows. Test rooms 12½ and 30 feet square have provided favorable scale for the lower and higher ranges of room ratio respectively. Various room reflectance patterns were used.

AUTHORS: Application Engineering Div., General Electric Co., Nela Park, Cleveland, Ohio.

For direct filament luminaires in large rooms, agreement between measured and carefully calculated utilization factors is excellent. With constant room ratio (fixed unit-to-work-plane distance) utilization factor varies slowly as suspension changes over its usual range; for the great majority of cases the range could be represented with little error by a single suspension of perhaps one-seventh of the ceiling-to-work-plane distance.

For direct fluorescent luminaires in continuous rows, measurements of direct ratio agree well with calculations based on special zonal multipliers applicable to these fixture patterns. These patterns may be represented reasonably well by the use of proper zonal multipliers for individual units.

Evaluation of the performance of downward components and construction of utilization tables can be facilitated by the use of a suitable flux-ratio (measure of concentration). A new and improved type is proposed. Utilization factor may be plotted against it, as in Fig. 1. This chart, a specimen for one reflectance combination and one spacing ratio, may be used to obtain Coefficients of Utilization for downward components as follows:

1. Determine the flux ratio of the downward component of luminaire output (see caption, Fig. 1).
2. From chart find utilization factor for each room ratio.

TABLE I.—Utilization Factors — Upward Components. (Ceiling Reflectance 0.80, Wall Reflectance 0.50)

Floor Room Ratio*	Refl.	(1) 0.10	(1) 0.30	(2) 0.10	(2) 0.30	(3) 0.10	(3) 0.30
0.6	(J)	.199	.209	.170	.175	.144	.148
0.8	(I)	.265	.278	.230	.238	.193	.200
1.0	(H)	.325	.340	.285	.296	.238	.247
1.25	(G)	.384	.403	.338	.353	.288	.301
1.5	(F)	.433	.458	.382	.401	.327	.343
2.0	(E)	.508	.544	.455	.484	.386	.410
2.5	(D)	.560	.610	.509	.546	.430	.462
3.0	(C)	.600	.661	.550	.596	.459	.498
4.0	(B)	.653	.733	.599	.660	.496	.546
5.0	(A)	.690	.783	.625	.697	.520	.580

*Room Ratio $= \dfrac{3\ (\text{width} \times \text{length})}{2\ CH_{wp}\ (\text{width} + \text{length})}$

3. To obtain Downward Coefficient of Utilization, multiply all utilization factors by the constant downward efficiency of the unit

$$\text{Downward efficiency} = \frac{0°\text{-}90°\ \text{luminaire output}}{\text{total output of lamps}}$$

For indirect components the effects on utilization of flux distribution, suspension, and trapping of ceiling-reflected light by the luminaire have been studied. The charts of Fig. 2 show some of the results in large rooms with high reflectances. Curves *A* and *B* apply for two different flux distributions from filament units providing the same physical obstruction to ceiling-reflected light. For a given spacing and suspension, a greater fraction of upward output is incident on the ceiling with distribution *B* than with distribution *A*. However, trapping of light is greater with *B* and increases rela-

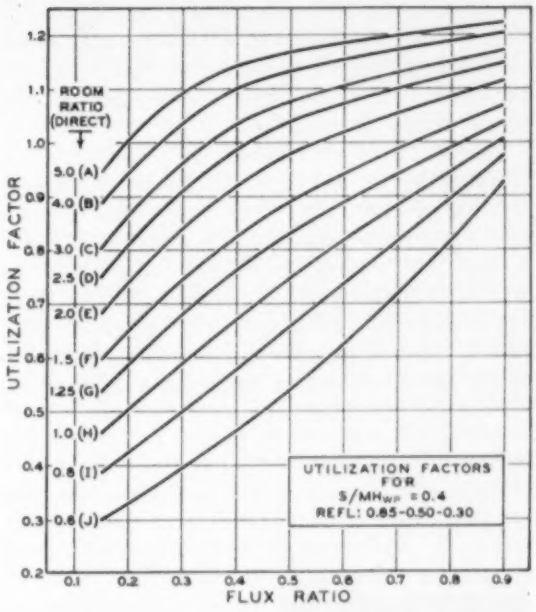

Figure 1. Specimen Flux-Ratio — Utilization Chart for one combination of room reflectances and one spacing-to-mounting-height ratio. Similar charts for other conditions of reflectances and spacing may be drawn. This chart is based on zonal-interflection calculations using an equation given in the paper. For room 11.25 feet high, unit suspension 15 inches, work-plane height 30 inches. The proposed flux ratio (index of concentration) used as an abscissa represents the fractions of downward output in certain 10-degree zones multiplied by the following weights and added:

Zone	Weight	Zone	Weight
0° - 10°	1.00	30° - 40°	0.50
10° - 20°	0.83	40° - 50°	0.33
20° - 30°	0.65	50° - 60°	0.16

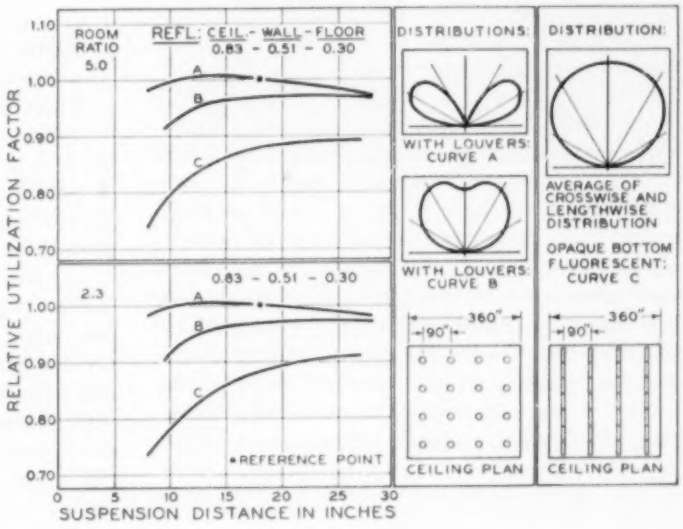

Figure 2. Examples of the effect of varying suspension distance for a fixed spacing of indirect luminaires. Ceiling height of room is also fixed — units are raised and lowered in room of constant room ratio. Curve A applies for the silvered-bowl unit with 14-inch diameter open concentric ring louver (black finish on inside surface of louvers). Curve B shows the effect of a narrower distribution with the same obstruction. For this purpose 6½-inch cylinders with diffusing glass cover plate were used with the same concentric ring louvers attached. Curve C shows the effect of trapping and obstruction from continuous rows of totally indirect fluorescent units that are opaque and 12 inches wide.

tively as units are moved closer to the ceiling. Curve *C* applies for rows of opaque fluorescent units having roughly the same flux distribution as for Curve *B*, but presenting much greater obstruction to ceiling-reflected light.

Tables of utilization factors are presented in the complete paper for three conditions of indirect lighting (or components):— (1) small size silvered-bowl units presenting minimum obstruction of the ceiling; (2) opaque fluorescent units 12 inches wide in continuous rows, suspended 22 inches from the ceiling; (3) the latter units suspended eight inches. Table I presents excerpts from these three tables for a reflectance combination of 0.80 for ceiling, 0.50 for walls, and 0.10 and 0.30 for the floor.

To obtain upward Coefficients of Utilization, multiply the tabulated values by the upward efficiency of the luminaire (Upward Efficiency = $\frac{90°\text{-}180° \text{ luminaire output}}{\text{total output of lamps}}$). When the luminaire has both upward and downward components, the coefficients for each, determined for the respective room ratio values,[1] may be added directly to obtain overall Coefficient of Utilization.

1. *Footnote:* The two Room Ratio values from the Harrison-Anderson equations are not equal unless suspension distance is $\frac{1}{3} CH_{wp}$. A proposal for revision of the room ratio system is discussed briefly in the Appendix to the paper.

Determinants of Fluorescent Lamp Life

Richard N. Thayer

THE USEFUL LIFE of fluorescent lamps most commonly ends when all of the emission coating has evaporated or sputtered off either cathode. Lamp design and service variables, therefore, affect life in proportion to their effect on the quantity and rate of usage of this coating.

Tests show that lamp life is about proportional to the weight of emission coating retained by the cathode through lamp manufacture. This weight can be roughly determined in finished lamps without breaking them open by use of a novel electronic tester. Life is importantly affected by cathode design, emission-coating composition, and many manufacturing variables. Small variations in the pressure of the argon starting-gas have significant effects on life. The gradual decline in light output with long burning sets an economic limit to useful lamp life, regardless of whether deactivation occurs. For typical present conditions, cost-of-light to the user is close to the minimum for present 7500-hour life ratings.

Routine checks of lamp life require standardization of the many variables of service operation. Choices have changed from time to time, particularly with respect to ballasts and starters, to keep pace with changing commercial practice and to improve testing precision. The long lives of present lamps necessitate long times to evaluate effects of new starter and ballast designs on lamp life. Also, the 25 per cent standard deviation found on fluorescent lamp life seriously limits the precision and reliability of comparative life tests on small groups of lamps and accessories.

Ballast and starter design variables often have large effects on lamp life. To help lamp users in their choice of those components, various specification and certification programs have been set up in the industry. These are subject to change as more is learned about accessory effects on lamp life. Also, design variations within these specification limits will still produce differences in lamp life, above the rated value.

The rms value and waveshape of lamp current are important determinants of lamp life. Their values are determined by ballast design and by line supply voltage. Another service determinant of life is starting frequency. Relative lamp life varies from 30 per cent at 10 minutes per start, to

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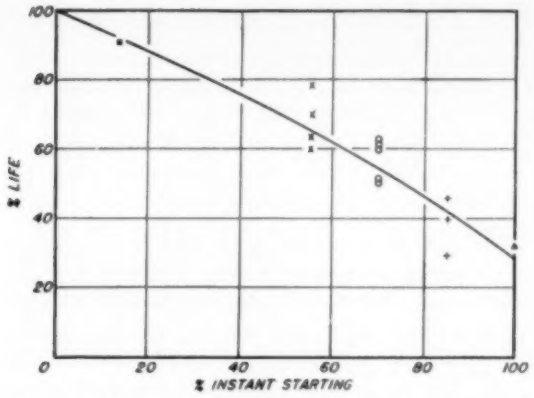


Figure 1. Effect of instant-starting on life of 40-watt switch-start lamps.

100 per cent at three hours per start, to 250 per cent for continuous burning.

In switch-start lamp types, life is greatly dependent on the adequacy of cathode preheat. Thermal-starter designs sometimes excel glow-starter designs in this respect, but the usage of glow starters is predominant because of their offsetting advantages. If switch-start lamps always start instantly (*i.e.*, without any cathode preheat) lamp life is reduced by two-thirds, and if they instant-start part of the time, life is proportionately affected. See Fig. 1. Many present-day lamps and installations are subject to this condition on the lead circuit in varying degree, but the strict test conditions for producing it for laboratory study have, for the most part, been determined only recently. Certain variations in ballast design vary the amount of instant-starting. Transients in glow-starters before contacts close are another contributing cause. Reversal of primary leads in stepup ballast designs is a partial remedy. While this instant-starting phenomenon produces shorter life on lead than on lag circuits, the average of both usually meets published life ratings. Compensated lead circuits are still important to obtain rated life; in extensive new tests, omitting the compensator reduced lamp life on lead circuits by 30 per cent. Trigger-start circuits reduce lamp life about 30 per cent, but provide compensating advantages for certain fields of use.

Additional data are summarized on relative lamp life of instant-start lamps for lead-lag ballasts *vs.* various designs of series-start.

Design of High-Output Fluorescent Lamps

A. C. Barr

W. J. Karash

THE DEVELOPMENT of fluorescent lamps of substantially higher light has always been an objective. Until recently poorer lumen maintenance, unfavorable ballast economics, and larger losses in light due to the heating effects of lighting fixtures made such designs uneconomic. Now greatly improved lumen maintenance, rapid-start operation, and the advent of new, well-ventilated lighting fixtures make such a design feasible.

Before adopting a high-output design, the effect of lamp current, tube diameter and length, and gas-filling type and pressure must be evaluated in relation to maximum light output, lamp efficiency, lamp life, lumen maintenance, practicality of lamp manufacture, and ballasting requirements. Final selection of the best lamp design is largely governed by the lighting economics afforded when used in practical fixtures under typical application conditions.

The paper reviews choices available in each of the lamp parameters. Curves are shown of the relationship between lamp current and light output,

AUTHORS: Application Engineering Department and Lamp Development Laboratory, General Electric Company, Lamp Division, Nela Park, Cleveland 12, Ohio.

TABLE I.—Lamp and Ballast Characteristics for Equal Light Outputs.

Lamp	Lamp Amps	Rel. Lamp Watts	Rel. Lamp Eff.	Rel. Lamp Volts	Nominal Ballast O.C.V.	Ballast Sizes & Losses	Lumen Maintenance
96T12 Argon	0.08	100	100	100	350	Satisf.	Good
96T8 Argon	1.0	115	85	105	525	Very high	Poor
96T12 Krypton	1.0	90	110	75	450	High	Good
90WT17 Argon & Krypton	2.5+	—	—	—	—	Very high	Fair

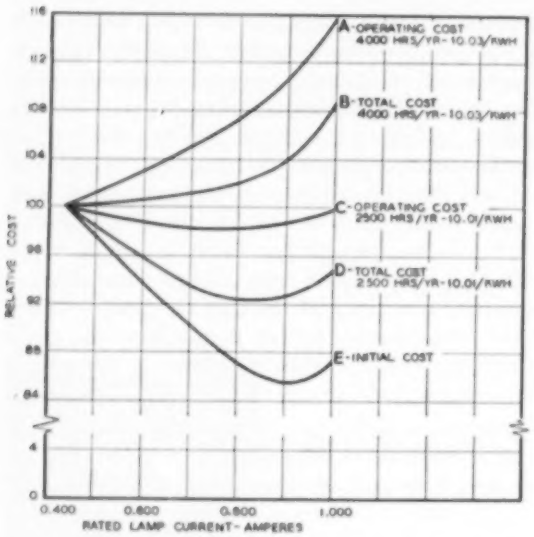


Figure 1. Lighting Costs vs Lamp Current — Two 96T12 Argon-Filled Lamps in Well-Ventilated Fixture. — Proper choice of higher current can substantially reduce initial lighting costs. Operating and total costs may also be lower for many common operating conditions.

lamp operating voltage, lamp wattage, lamp efficiency, and mean light output during life.

Choice of ballast type is related to lamp starting requirements which are defined in terms of the two conditions which must be met. A peak voltage high enough to break down the tube and permit the flow of a very low current must be supplied. In addition, an R.M.S. voltage, higher than the maximum value of the voltage-current characteristic of the lamp, must be impressed across the electrodes.

The first requirement is effected by gas-filling and cathode conditions and by starting aid arrangements. The second condition is largely unaffected by gas purity and starting aid, but is also dependent on gas-filling and cathode considerations. The study clearly indicates the superiority of rapid-start design for high-output lamps.

Comparison of characteristics on an equal light-output basis provides a convenient way of evaluating the lamp types considered.

Study of the table indicates the 96T12 argon-filled lamp to be the best choice among the designs listed.

Determination of heating effects in fixtures and cost analysis are needed to indicate the overall usefulness high-output design and to select optimum lamp operating current. Extensive fixture studies indicated that 0.8 ampere argon-filled lamps would lose only about three per cent more light than 0.425 ampere lamps when used in well-ventilated fixtures. In more enclosing types such as closed-top, closed-end industrial fixtures, the differential becomes seven per cent.

Cost analysis (Fig. 1) shows that high-output lamps can substantially reduce initial costs per footcandle without substantially increasing overall costs for usual conditions of use.

High-output fluorescent lamps can provide the higher illumination levels needed in many applications where space or other factors limit the number of fixtures that can be installed and where their higher brightness can be properly handled. Since they have much less fall-off of light under low ambient temperature conditions, they will be useful in many outdoor applications as well.

Discussion of Conference Papers

Written discussion on any of the technical papers presented at the I.E.S. 1954 National Technical Conference should be submitted immediately for publication in ILLUMINATING ENGINEERING.

Send: One copy (original) to Miss Ruby Redford, Editor, ILLUMINATING ENGINEERING, 1860 Broadway, New York 23, N. Y.

One copy to Dr. R. M. Zabel, Co-Chairman, Papers Committee, at Westinghouse Electric Corp., Bloomfield, N. J.

One copy to the author of the paper.

President Manwaring (Continued from page 414)

mittees exemplify the maximum efficiency of our Society. I have called this to the attention of our membership throughout the country.

(4) Never, in my entire experience with any society work have I met men and women who were so congenial to work with, single-minded and loyal to each other, always placing the work of the Society foremost in their efforts.

In summation, let me express to all how much Esther and I have enjoyed working as a part of the Illuminating Engineering Society, and express the hope we may have the opportunity to continue to contribute to this great organization which, through association, has helped us during the past many years.

It has been a pleasure to serve you as President and an honor to turn the leadership to your most capable and respected President-elect, Duncan Jones.

President-Elect Jones (Continued from page 416)

ence, develop new ideas of interest, arrange for nominations from his region to national offices, and attend Council meetings. He is the governor of his realm and carries with the job a heavy responsibility. He needs the sympathy and support of all concerned. Needless to say, we shall continue to vitalize our Regions, Sections and Chapters, through our energetic Regional Activities Committee.

Another factor in our technical progress as a Society lies with our publications program. All concerned with this will continue persistent in their efforts to improve our monthly journal, and conclusive in their determination to place our publications in the hands of those who will utilize our material effectively. Have no fear, our publications program will continue to be an outstanding feature in the Society's performance.

A president planning his entry to this office is overflowing with enthusiasm, ambition and inspiration until he comes face to face with the budget. He breathes normally at first, then he either loses his breath or gets fighting mad and decides he will soon rectify the situation by courageously striking out for more sustenance.

It is evident that as the Society grows, and its duties, responsibilities and ambitions increase, even so do the expenses mount. Unless we earnestly seek greater sustenance we shall not keep pace with technical advancement.

Thus the recommendation emerges that we strike out this year on an energetic campaign for greater sustenance. Sustenance that not only furnishes the funds to maintain the high standards of operation set by the Society, but make possible each year an expansion of our technical studies and particularly that of our research program.

Sustaining Members reap handsome dividends from the work of the Society. Dividends that are expressed in the satisfaction and profits enjoyed in passing the benefits on to the people they serve. We can have every confidence that not only will our present members appreciate, understand and value our appeal and willingly increase their contributions, but many new members will join and participate.

It has been a privilege to address you, and it will be an exciting experience to serve as your administrative head next year. It is a position that I will highly respect and faithfully endeavor to administer with diplomatic dignity and in accordance with your wishes and the constitutional requirements of the Illuminating Engineering Society.

1954-1955 Officers

A complete listing of the National Officers and Council, and of the Section and Chapter Chairmen and Secretaries, will appear in the October issue of ILLUMINATING ENGINEERING.

Answers to Some Re-lighting Problems

Which is the more interesting job to the lighting man? A nice new modern building with lighting plans correlated with the building design? Or re-designing an antiquated lighting system in an old building?

Perhaps both have their challenging aspects. In any case, the following re-lighting installations were considered their "Most Interesting Lighting Job" by these I.E.S. members, and their jobs took first prize in their Section's contest. Perhaps part of their satisfaction was in the solution of difficult lighting problems — and the transformation of an unattractive visually uncomfortable area into a pleasing comfortable interior.

Re-Lighting an Old School Auditorium

First Prize
Pittsburgh Section

SEVERAL satisfactions accrued from re-lighting the Clairton (Pa.) High School Auditorium. For one thing, the existing installation of suspended enclosing glare balls was so poor as to make the area almost useless for its purposes — stage presentations, basketball (on stage) and assembly-hall study. The latter purpose was abandoned entirely. Further, it required two men and an awkward arrangement to maintain the system.

In addition to the satisfaction of changing all that, the re-lighting program provided an opportunity to apply illuminating engineering principles to several interesting problems — auditorium lighting, stage lighting, and sports lighting. Since the public as well as the school uses the area, the job was an opportunity to demonstrate what could be done with old buildings at a time when an already contemplated school re-lighting program was meeting luke-warm acceptance.

All these satisfactions were reaped by Hugh S.

Stage lighting — white lights only.

Before and after in the auditorium as viewed from the stage.

James, lighting utilization representative for Duquesne Light Company, Pittsburagh, Pa., plus the final one of winning first prize in the Pittsburgh Section's contest for My Most Interesting Lighting Job.

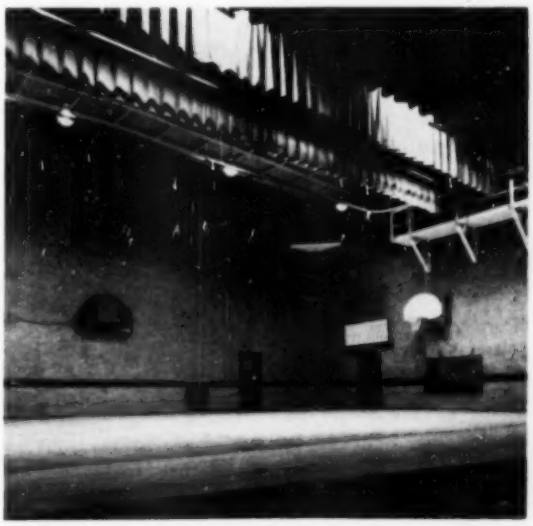
A summary of the lighting plan developed for an integrated lighting system provided:

1. *Auditorium* — Forty-eight 300-watt recessed light boxes in the main ceiling arranged in a pattern around the ceiling grills where the old units had been located, plus 24 200-watt recessed light boxes in the under-balcony area. An average illumination level of 20 footcandles is obtained, with uniform distribution. The area also has good brightness ratios and is relatively shadow-free because of the high cut-off obtained with the use of distributing type recessed units. All maintenance is from above the ceiling, and can be done easily by one man.

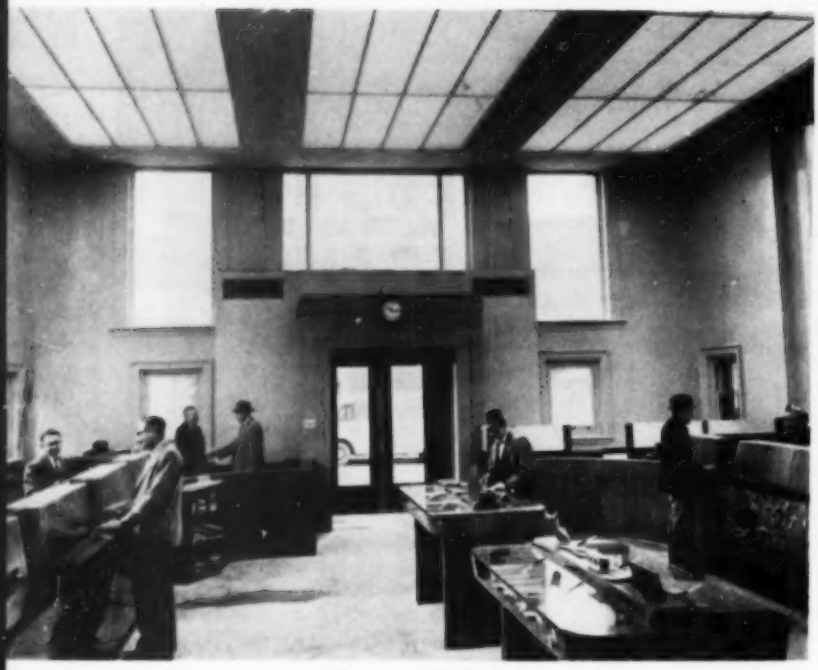
2. *Stage* — Three sets of color borderlights are used, each having three 13-foot sections with 150-watt lamps six inches on centers in alternate red, white and blue and designed for a cyclorama setting for two stages, 12 feet and 20 feet in depth. Nine circuits are in each border for a total of 27 circuits to provide flexibility of control. As an example of the results — with white lamps only with the cyclorama stage setting at 20-foot depth, illumination ranges from 140 footcandles at the back curtain to 40 footcandles at the front curtain.

3. *Basketball Floor and Gym* — Color-corrected mercury lighting is used here, a first in this area, and among the first in the country for this application. Eleven 400-watt J-H1 color-corrected mercury vapor lamps are mounted in high-bay ventilated type aluminum reflectors, 27 feet above the floor. Use of this source here kept the number of units to a minimum and utilized existing wiring and conduits. These units are balanced on a four-wire three-phase system and provide freedom from stroboscopic effect, relatively low brightness and high delivered illumination values at floor level, between 40 and 50 footcandles.

Emergency lighting was provided by using all of the old ceiling outlets and installing, in the center of each ceiling grill, 150-watt R-40 reflector flood lamps over high ceiling areas, and 150-watt inside frosted lamps over the balcony area.



Stage used as basketball floor, with color-corrected mercury lighting.



New acoustical-luminous panel ceiling, left, replaces 35-foot dome with bare-lamp chandelier, above.

Re-Lighting the Farmers' National Bank

First Prize
Eastern Pennsylvania Section

SEVERAL times, already, Boyertown, Pennsylvania (pop. 4200) has been mentioned in national advertising as an example of progress in small towns. The Farmers' National Bank there, with its "ceiling of light" is right in line with the town's progressive tendency.

For the re-lighting program in this old building, difficult structural details called for careful consultation between the electrical contractor (Arlan Longacre of Bally, Pa.), the lighting engineer (Frank E. Heins, head lighting consultant for Metropolitan Edison Co., Reading, Pa.), and the power company's representative (C. J. Hartman, Jr.). Presented by Mr. Hartman, the job took first prize in the Eastern Pennsylvania Section's contest for My Most Interesting Lighting Job.

One of the more difficult problems they faced was a domed ceiling 35 feet high. Original lighting was from a bare-lamp chandelier, which didn't even have decorative detail in its favor, suspended from the apex of the dome.

Solution to the ceiling problem was a suspended ceiling structure of wood, built approximately 21 feet 6 inches above the floor, and well below the dome. From this studding a new ceiling was formed, consisting of acoustical tile sections 27 inches wide around the perimeter of the room and between luminous panels. These luminous panels were of 2-foot by 8-foot corrugated plastic sections suspended by a metal hanger assembly. To break the monotony a pattern of 16 2-foot square beveled plastic "dishes" was inserted in the central part of the ceiling.

Catwalks were provided above the acoustical tile sections for servicing the lighting equipment or for cleaning the plastic panels. For this maintenance the entire ceiling area may be reached from a second floor balcony room.

Above the new ceiling, strip lighting units equipped with steel white enameled reflectors are mounted on 24-inch centers, 18 inches above and centered over the rows of plastic panels. These units are equipped with 60 96T12 slimline fluorescent lamps operated at 430 ma. Maintained illumination is 65 footcandles.

Re-Lighting the Citizens' Savings and Loan Society

First Prize
Inland Empire Chapter

ARCHITECT and lighting engineer worked plan-to-plan in the remodeling of this old building into a small modern bank. Result: principles of both elements enhance one another for a pleasant, comfortable, integrated interior. Design for the lighting earned for its engineer, Ted Beadle of Washington Water Power Company, Spokane, Washington, first prize in his Section's contest for My Most Interesting Lighting Job.

Esthetic goal for the lighting was a feeling of spaciousness in what was essentially a long narrow area — 20 feet wide and 50 feet long. The space was further cluttered with three different ceiling heights of 8, 14, and 18 feet. Illumination goal was to be 70 footcandles minimum maintained.

Contributing to both spaciousness and effective functional lighting is the 10-foot by 20-foot luminous panel, forming in effect an artificial skylight which dominates the highest ceiling area. Here too, however, architectural features inherent in the old building required careful planning. The luminous panel section must light both the main floor 18 feet below, and the balcony 9 feet below. Both are important work areas.

By dropping a new ceiling two feet from the old one, a coffer was formed, 10 feet by 20 feet and two feet deep. This was made of plywood painted with 80 per cent reflectance white paint. Five rows of bare lamp strips, consisting of two 2-lamp, 75-watt slimline, and one 2-lamp 36-watt slimline per row, were installed on the ceiling of the coffer. Patterned polystyrene plastic panels two feet square, of only 285 footlamberts brightness, provide the diffusing element. The panel provides the high levels of comfortable lighting aimed at for the working areas ,and at the same time an architectural "reason" for the difficult ceiling.

All other equipment is recessed, varying the diffuser lens and light source for the ceiling height and work area encountered. Drop lens fluorescent troffers were used in the 14-foot ceiling area. The 8-foot ceiling under the balcony was too low for this lens, and a flat low-brightness lens was used with pleasing results.

Illumination levels, after three months of use, were 110 footcandles at the balcony work area, 105 footcandles at the tellers' windows, 100 footcandles in the work area behind the tellers and in the officers' area to the front of the lobby.

One of the two TV rooms, with new lighting system.

Re-Lighting a Drive-In Restaurant With TV Viewing Rooms

First Prize
Georgia Section

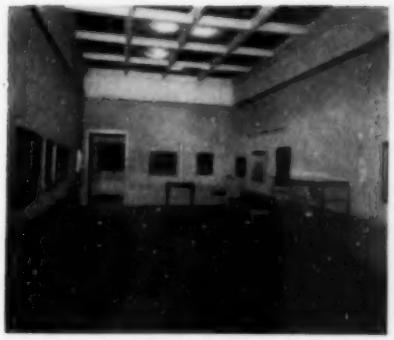
THE "VARSITY" in Atlanta is one of the world's largest drive-in restaurants, and part of its attraction are the unique public television rooms. While the re-lighting of the restaurant had its "most interesting" aspects, it was the engineering required for re-lighting 48-foot by 18-foot television viewing rooms which impressed the judges of Georgia Section's contest, and won first prize for S. J. Andre of the Georgia Power Company.

Restaurant service area, as re-lighted.

The restaurant part of the area was re-lighted with a continuous row, about 88 feet long, of 6-lamp 75-watt luminaires, using 96T12 Deluxe cool white slimline lamps, shielded 45 degrees lengthwise and 27 degrees crosswise. Illumination level is 90 footcandles at the active serving area, and 40 footcandles along the wall lines.

Television rooms adjoin the restaurant and feature 30-inch television screens with Polaroid lens, and one-arm chairs where customers repair to enjoy the show along with their hot-dogs. In an area as large as 48 feet by 18 feet, what would be the recommended level and method of lighting for television, at the same time avoiding images on the screen? What recommended seating arrangement and viewing angles? The current literature did not foresee Southern enterprise in creating such an area in the first place, and the answers were not in the book.

Low-brightness totally direct equipment was felt to be the answer, with 50 footcandles maintained illumination, the deciding factors being the per cent of light that would be reflected back to the ceiling and walls from the floor and furnishings. Low-brightness diffuse Alzak parabolic aluminum troffers with 42/22 shielding were installed in the pattern shown in the photograph. Introduced also was a concave control lens using a 150-watt incandescent lamp. An existing 12-circuit panel board serving the two television rooms, from which can be controlled either the fluorescent or incandescent, or alternate rows, added flexibility to the system.



Before and after views of the East Gallery.

Re-Lighting the Muskegon Art Museum

First Prize
Western Michigan Chapter

THERE ARE always two problems in re-lighting public buildings, in addition to the achievement of a comfortable and functional lighting system. First, each member of the Board of Directors has his own ideas as to what should be done. Second, modern lighting equipment must be made to fit in with traditional style buildings. Re-lighting the Hackley Art Museum in Muskegon, Michigan, was a "Most Interesting" job for James Q. Miller, Consumers Power Company, Muskegon, and won for him the first prize in the Western Michigan Chapter's contest.

The museum, a modified Greek classic, was erected in 1912, and in its early years held the distinction of being the first gallery of importance in the country in a city with a population at that time of under 30,000. Unfortunately, typical of art galleries in the early years, little thought was given to artificial lighting needs, and a glass roof and skylights provided only an inadequate 8 to 12 footcandles general illumination with only 3 to 7 footcandles on the paintings.

After several weeks of study architect and illuminating engineer, with the permission of the Directors, decided on a fiberglass suspended ceiling with recessed fluorescent and adjustable incandescent units. The East Gallery, shown here, was the first to be re-lighted.

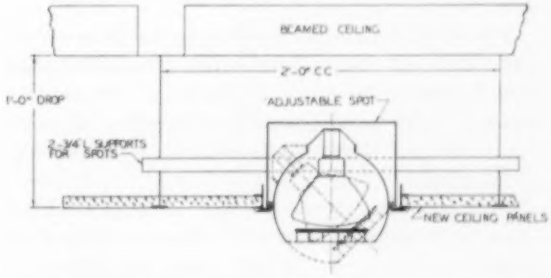
The new ceiling is composed of 2 x 4-foot, ¾-inch thick fiberglass ceiling board panels, set in aluminum frames weighing ½ pound per square foot. The panels were dropped one foot below the old beams (see drawing).

Four-lamp recessed louvered fluorescent luminaires, using 40-watt Deluxe cool white lamps, provide a general illumination of 35 to 40 footcandles. Semi-recessed adjustable 150-watt PAR-38 spotlights, focused on the paintings, raise the vertical surface level to 50 footcandles.

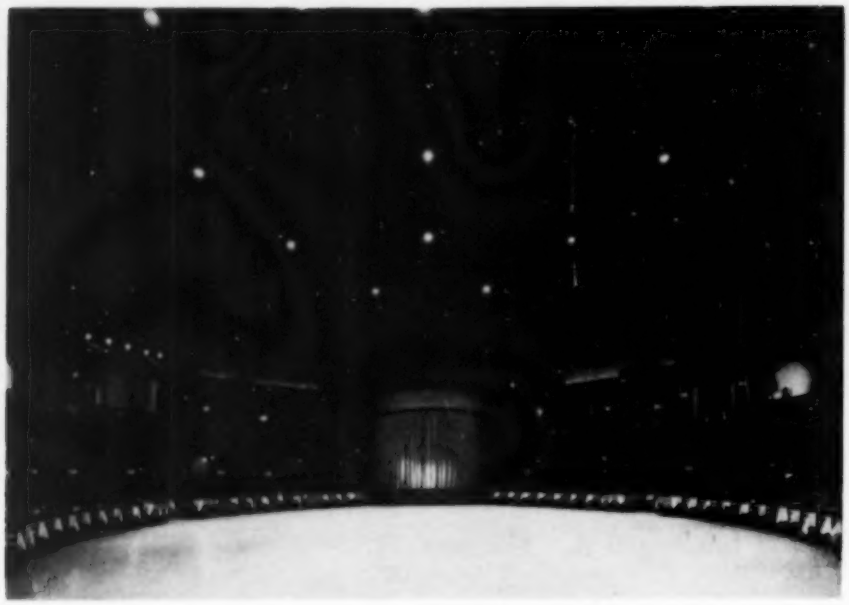
Typical brightness readings in the renovated galleries are: white ceiling, 5.3 ft-L; beige cotton brocade walls, 4.3 ft-L; mottled brown linoleum floor, 4.2 ft-L; luminaires viewed at 45 degrees, 610 ft-L.

The installation in the East Gallery so pleased the Board of Directors that wholehearted approval was given to continue with the Main Gallery and the North Gallery, where the same type lighting system was used with the same success.

Architect Arthur M. Hooker and Wholesaler L. G. Thompson cooperated with Mr. Miller on this job.



Detail showing angle supports for the adjustable spots. Ceiling is hung one foot below the existing ceiling beams.



First Prize
Indiana Chapter

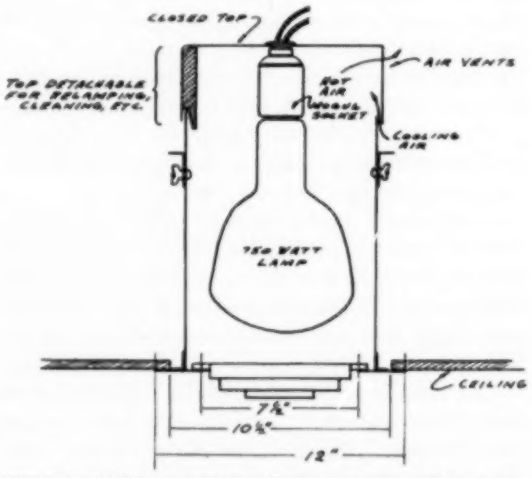
Re-Lighting the Indiana Roof Convention Hall

HERE IS a new application for R52 lamps. It is part of the solution to the re-lighting problem encountered by George E. Ransford, Indianapolis Power and Light Co., whose installation for the Indiana Roof Convention Hall won first prize in the Indiana Chapter contest for My Most Interesting Lighting Job.

The hall is an enormous room. Essentially it is a perfect oval, with a high vaulted ceiling. Its purpose is two-fold. First, it is frequently used for large dances, for which simulated blinking stars, and even moving clouds overhead, are part of the decorative effect. Both of these effects are obtained with special light sources without using equipment on the ceiling. Secondly, large conventions use the area.

The problem that classified this installation as "My Most Interesting" was — what to install that would provide adequate illumination for conventions and still not destroy the atmosphere of dancing under the stars? And economy, as usual, was a factor.

Ten carefully spaced recessed downlights have been installed in a suspended plaster ceiling at a maximum height of 40 feet above the floor, arranged in an oval, with three additional units down the center of the room. These have been lamped with 750-watt R52 industrial reflector lamps, and equipped with louvers for control of glare. Positions and beam spread of the units were controlled to prevent spill of the beam from causing scalloped patterns on the wall. This layout provides 15 foot-candles of uniform illumination precisely on the oval dance floor, with a sharp cut-off on the floor's edge.



R52 industrial-type reflector lamps are recessed in a suspended plaster ceiling. Concentric louvers control glare.

Lighting and decoration made the transformation in the Chapel of Mount Saint Mary's Seminary from the view shown above to that at right.

Re-Lighting a Seminary Chapel

First Prize
Ohio Valley Section

WHEN first called in on the job, Harold J. Gruber, of the Lighting Division of Cincinnati Gas and Electric Co., was asked for advice only on redesigning the ornamental bronze lanterns which were one main source of illumination in the chapel of Mount Saint Mary's Seminary in Norwood, Ohio. The lighting system which Mr. Gruber ended up by installing was the winning entry in the Ohio Valley Section's contest for "My Most Interesting Lighting Job."

The entire chapel was being redecorated, with scaffolding erected under one-fourth of the ceiling where an artist was painting elaborate murals, when the planning for the lighting was first considered by the authorities. Since considerable reading for rather long periods of time is done in the chapel, a level of at least 25 footcandles is needed. No modification of the bronze lanterns would produce this level without excessive brightness.

Tact and persuasiveness were, it seems, preliminary qualifications for this job. By the persuasion of good lighting knowledge, the authorities finally agreed to the removal of the lanterns, and also of the side candelabra units. These were mounted about eight feet from the floor and contributed nothing to the lighting system—except glare. Now the re-lighting of the chapel proceeded from scratch.

The nave is 130 fet in length and 40 feet wide, with a ceiling height of 35 feet. Finding that the area above the ceiling was readily accessible for servicing a downlight system from above, this plan was chosen for the general illumination. Six-inch diameter downlights, with 1000-watt lamps, specular Alzak reflectors and matte-black finished annular baffles, seemed to fill the bill. Shielding angle of the baffles is 25°.

Although the aperture of the downlights is only six inches, the plaster or finishing ring was slightly

Downlights alone in use.

Wall urns alone in use.

larger than the design the artist had worked out for the points decided upon for the location of the downlights. However, the artist was prevailed upon to go back over the already completed work and include the plaster rings into his oil-paint and pure gold-leaf design.

The curvature of the front of the chapel in the sanctuary made it impossible to place the downlights any farther forward than the last section behind the large hanging Crucifix. In this area 1000-watt downlights of the same basic design were used with 120° polished Alzak shovel reflectors to provide uniform lighting on the rear wall and on the large oil painting behind the Altar.

In all, 14 standard downlights and 2 with shovel reflectors were used, and with this system alone the illumination level is approximately 22 footcandles.

To provide an upward component of light and display the decorative ceiling, reflector floods were first tried, mounted at the top of each pilaster. Experimental work with this method proved it unsatisfactory, with hot spots at each pilaster, side walls too dark and brightness ratios too high. Wall urns, containing 150-watt reflector floodlamps, were then installed on each column, about eight feet from the floor, at the location of the old candelabra units. With cut-off of the light carefully worked out to provide uniform ligthing over the entire ceiling, these urns supply a level of about 3 footcandles — incidentally, the same as was produced by the original lighting system of lanterns and side wall candelabra. Average illumination, with the new system, from downlights and urns totals 25 footcandles maintained.

Where to Tune in for Jubilee Television Program

Light's Diamond Jubilee will be celebrated October 24 with a two-hour television program. A listing of local stations which will carry the program has been compiled by the Jubilee Committee and can be found on pages 44A, 45A, 46A and 47A of this issue.

INSTALLATION IN RESIDENCE OF MR. AND MRS. CHARLES CORGE, SHORT HILLS, N. J.

Lighting a Dining Room

LIGHTING OBJECTIVE: (1) To provide a pleasant balance of background illumination for dining; (2) to highlight the dining table and centerpiece; (3) to relate the lighting design with the architectural and decorative features to give an integrated effect.

GENERAL INFORMATION: The room is 16 feet 2 inches by 13 feet with an 8-foot ceiling. The walls and wall-to-wall carpeting are gray, approximately 50% reflectance, and the "grayed" birch paneling of the planter and buffet is approximately 40%. The drapery fabric has a medium green background, 35% reflectance, with a delicate pattern of darker greens, 7% to 12%, and accents of gold, 30%. The dining table is black and the matching chairs are upholstered with a light beige fabric.

INSTALLATION: General room illumination is furnished by a combination of a lighted cornice at the expansive window area, recessed lighting above the mirror niche in the built-in buffet, and lighting concealed above the planter which together with a dividing wall partially separates the dining room from the living room. All fluorescent lamps used in the installation are deluxe warm white. Accent lighting on the table is provided by a recessed luminaire (Spear Lighting Mfg. Co., Brooklyn, N. Y. No. 201) equipped with a 150-watt, R-40 spot lamp.

With all lighting equipment in operation (see Fig. 3 for lamp sizes), the illumination outside the spotlighted table area averages 11 footcandles. With the cornice lighting and spotlight, the lighting level near the edge of the table averages 25 footcandles, and in the center of the table reaches 110 footcandles. The custom-built recessed lighting (Leader Division, Benjamin Electric Manufacturing Co. No. 8240) above the mirrored buffet niche produces illumination over the area below varying from 9.5 to 12 footcandles. The maximum brightness of the etched glass panel viewed from a standing position five feet away is about 700 footlamberts.

(over)

A.I.A. File No. 31

Figure 2. (above) View showing niche lighting over buffet.

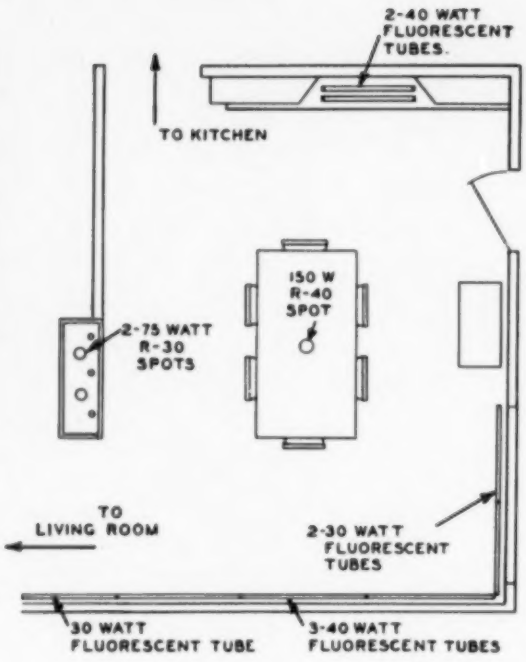


Figure 3. (right) Plan view showing all lamps employed.

Drapery brightnesses are as follows:

Cornice board	2 ft-L
Drapery at bottom of cornice	165 ft-L
Drapery 1′ below cornice	8 ft-L
Drapery 2′ below cornice	4 ft-L
Drapery 3½′ below cornice	1 ft-L*
Drapery 5′ below cornice	2 ft-L*
Drapery 7′ below cornice	10 ft-L*

*This build-up on the bottom of the draperies is light coming from the ceiling unit and reflected from the light carpet.

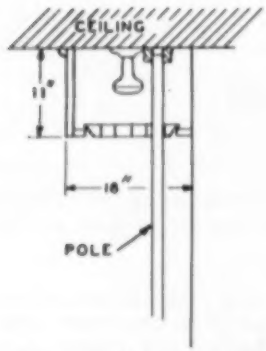


Figure 4. Detail of planter lighting using two 75-watt R-30 spotlamps.

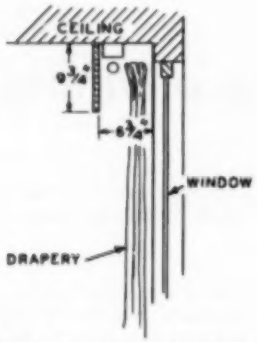


Figure 5. Detail of lighted cornice.

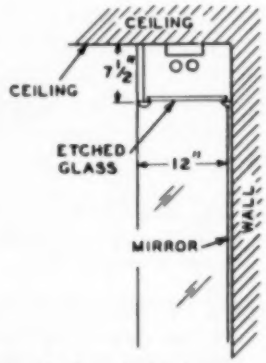


Figure 6. Detail of lighting in mirrored niche.

Builder: Leonard Giaimo, Newark, N. J.; lighting designer: Jack Kilpatrick, New York, N. Y.

Lighting data submitted by Edith L. Buchholtz, Lamp Division, Westinghouse Electric Corporation, Bloomfield, New Jersey, as an illustration of good lighting practice and to aid in the design of similar installations.

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9-54

Questions and Answers on light sources

The I.E.S. Committee on Light Sources, under the chairmanship of H. F. Davidson, has prepared this discussion as an answer to questions concerning the high-frequency operation of fluorescent lamps. Readers are invited by the Committee to submit similar questions concerning the high-frequency operation of fluorescent Questions may be sent in care of the Society headquarters office.

High-Frequency Operation of Fluorescent Lamps

The operation of fluorescent lamps on power frequencies higher than 60 cycles has been accomplished in some special applications such as aircraft and motor-coach lighting, and has been under study for a number of years for more general use. Periodic reports in the form of articles and technical papers have appeared in the literature (see bibliography).

Comprehensive tests on lamps and ballasts have shown many advantages such as higher lamp and circuit efficiency, reduction of ballast weight and heat loss by as much as 90 per cent and the ability to load the lamp to higher or lower current for increased lumen output or lower brightness. Preliminary tests indicate this flexibility of operation may be accomplished without sacrificing lamp life. The success of the system for general applications depends upon an economic means for converting 60 cycles to a higher frequency.

Converters — At the present time there are two practical methods for changing 60 cycles to a higher frequency: (1) Static System (Magnetic Frequency Converter 360 cycles). (2) Rotating Converters (Motor-generator Sets 400 cycles or higher).

The magnetic frequency converter was designed for use with fluorescent lamps. It has no moving parts and can be treated as a transformer. A control on the panel makes it possible to regulate the current to the lamp load for maximum flexibility. Two of these units (5 kw each) have been successfully operated at Beltsville, Md., for experimental plant growth and others are planned for similar applications. This equipment is now listed in five kilowatt sizes. At the present time the initial cost, size and weight of the converter are such that it is not competitive with the 60-cycle system for general applications. Future developments may result in considerably reduced costs.

The rotary converter is well known and has been in use since the turn of the century. In large sizes this equipment may be low enough in cost to provide an economical means of conversion for use in some industrial and office lighting installations.

Both types of converters produce noise of 360 or 400 cycles and must, therefore, be located in the transformer vault, blower room or some enclosure where the noise can be isolated. The lighting installation will be silent in operation where the static type frequency converter is used as the power supply. It is expected that ballasts designed for rotary converters will not exceed the noise level of comparable 60-cycle ballasts.

Ballasts — The magnetic frequency converter is designed to operate lamps by means of light weight capacitor ballasts. The ballasts weigh approximately 6 ounces and are about the size of a pack of cigarettes. Losses vary from 1 to 3 watts depending on lamp size. Fixtures using these ballasts will have the minimum of wiring and weight.

Ballasts used with the rotary converter will probably be of the split-phase type, *i.e.*, a series capacitor and a series choke coil for alternate lamps. This will provide a load of unity power factor and give maximum utilization of the available power from the converter.

Field experience with high frequency lighting is rather limited and we expect that one or two years will be required before sufficient information is available to determine the value of this new lighting tool.

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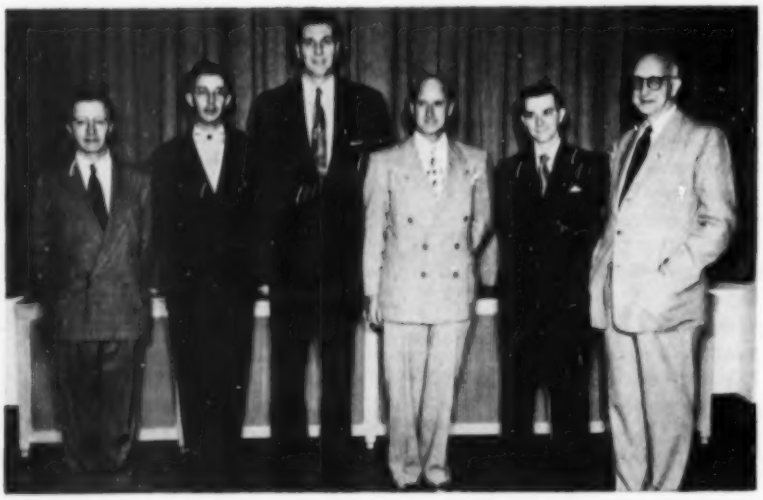
Here and There with I.E.S. Members

I.E.S. members of the Georgia Section, assisting in the arrangements for a South-wide workshop on industrial vision and lighting to be held at Georgia Tech, November 18, are Harry T. Yopp, (second from the left) and J. B. Browder (not shown in photo). Others in the picture are: l. to r., Miss Edith Schmiedescamp, Georgia Industrial Nurses Association; Col. Lambdin Kay, Associated Industries of Georgia and Robert E. Eskew, Georgia Tech. See story on page 14A.

H. A. Stroud (left), retiring Chairman of the Better Light Better Sight Bureau Home Lighting Education Committee, is presented with a scroll citing his long service in that position by S. L. Drumm, retiring Bureau Chairman. Immediately after the presentation, Mr. Stroud accepted the mantle of Bureau Chairman from Mr. Drumm.

Annual dinner-dance and golf tournament topped off the year, June 29, for the 87 members, wives and guests of the Rochester Section, I.E.S. Here W. S. Barclay and Harold Linder (standing at right) announce the door prize winners. At left at the head table are incoming Section Chairman Royal S. Conheady and retiring Chairman Floyd Owen.



Entrants in the East Central Region's contest for My Most Interesting Lighting Job were: left to right, A. Fox, Capital Section; H. Dean Wolfe, Maryland Section; Hugh S. James, Pittsburgh Section; J. J. Tynan, Philadelphia Section; Charles J. Hartman, Jr., Eastern Pennsylvania Section. At right is Roland Hoot, Chairman of the Philadelphia Section. For story on how the Region conducted its contest, see p. 14A.

TELECAST

LIGHTING NEWS OF CURRENT INTEREST

I.E.S. Gold Medal Nominations Due January 1

Nominations for the Society's highest award—the I.E.S. Gold Medal—are now being considered by the Medal Award Committee. Nominations for the award are invited from all members — closing date for their receipt is January 1.

The I.E.S. Gold Medal is awarded for the purpose of giving recognition to meritorious achievement which has conspicuously furthered the profession, art or knowledge of illuminating engineering. In making nominations for the Award, the following points should be observed.

(1) Candidates for the award need not be members of the Society, nor citizens of the United States or Canada, and may be nominated at any time by any member of the Society, by presenting to the General Secretary at Society Headquarters the name of the individual whose accomplishments in his field are deemed worthy of such recognition, whether it be in the field of engineering design, applied illumination, optics, ophthalmology, lighting research, education, or administration and management.

(2) In order for a candidate to be considered for the award of a given year, a letter requesting consideration of the proposed candidate shall be delivered at the General Office of the Society Headquarters before January 1 of that year.

(3) Nominations and records on file in the General Office from previous years, as reviewed and referred to the next year's committee by the previous Medal Award Committee will be given consideration along with new nominations.

The I.E.S. Gold Medal, established in 1944 is accompanied by an appropriately engrossed certificate of award. The Medal has been presented in past years to: George H. Stickney, Preston S. Millar, E. C. Crittenden, Matthew Luckiesh, Sir Clifford Paterson, Ward Harrison, William F. Little, and H. H. Magdsick. Most recent recipient, in 1954, is Erwin F. Lowry.

Ten I.E.S. Members Elected to Fellow Grade

Ten distinguished members of the I.E.S. have been elected to the Society's highest grade, that of Fellow, by letter ballot reported to the Council Executive Committee July 8. The elections, on recommendation of the Board of Fellows, were for:

Carl E. Egeler, now retired, was Illuminating Engineer in the Application Engineering Department, General Electric Company, Cleveland, where he was instrumental in the development of numerous special lamp applications for difficult areas. Mr. Egeler has contributed basic information in the fields of industrial lighting and lighting maintenance, serving on I.E.S. Technical Committees and presenting papers before the National Conferences. In the field of mine lighting, his researches resulted in information on new designs in miners' cap lamps, and as delegate to the C.I.E. 1939 meeting in Eindhoven, Holland, he presented a paper on "Changing Requirements and Lighting Factors for Coal and Metal Mining in the United States." Mr. Egeler has participated actively in Federal Government lighting activities as a member of the Navy Industry Lighting Committee which is responsible for the modernization of ship illumination, and in cooperation with the Navy Bureau of Ships in studies regarding development of high candlepowers for signalling searchlights.

Myrtle Fahsbender, Director of Residence Lighting, Westinghouse Electric Corp. Miss Fahsbender has the distinction of being the first woman delegate to present a paper before an international session of the C.I.E., speaking before the Stockholm meeting in 1951 on "Two Decades of Residential Lighting in the United States." She has presented numerous papers on home lighting before I.E.S. Conferences and has served as member and chairman of the Residence Lighting Committee and the Home Lighting Data Sheets Committee. Author of the text book "Residence Lighting," published in 1947 by D. Van Nostrand Company, Miss Fahsbender was also Chairman of the I.E.S. Committees that prepared the Recommended Practice of Home Lighting, 1943-45 and Contemporary Lighting in Modern and Traditional Interiors, 1947-1950. In addition to these and other committee activities, Miss Fahsbender served the Society as Director in 1948-1951, the only woman member to have held this honor.

Dan M. Finch, Associate Professor of Electrical Engineering at the University of California, Berkeley. Professor Finch's studies have ranged from the development of a register control for printing three-color overlays in the Technicolor process and a background projection screen and triple head projector for a large motion picture company, to his Visibility Studies under Adverse Weather, a project at the university under the sponsorship of the Navy Department, and his investigations on measurement of pavement brightness, auto headlamp glare and visibility distances using tinted windshields. He is author of many papers on these subjects and also on nomenclature, and is Chairman of the I.E.S. Committee on Nomenclature, as well as serving on the Street and Highway Lighting Committee. Professor Finch is Director of the Industrial Testing Engineering Laboratory, in Berkeley, for photometric, electrical and mechanical testing of lighting equipment, and a Director of the Testing Agency of the California Highway Patrol Laboratory for testing and research on automotive equipment. He has invented a low-voltage d-c Inverter for use in photocell and thermocouple circuits. He is also chairman of several technical committees of the C.I.E. assigned to the United States National Committee.

Kurt Franck, Vice-President in Charge of Engineering, Holophane Co., Inc., Newark, Ohio. Mr. Franck is responsible for the design of many original luminaires employing prismatic light control in commercial, industrial and street light-

New Fellows

Carl E. Egeler

Myrtle Fahsbender

Dan M. Finch

Kurt Franck

Kasson S. Gibson

John J. Neidhart

Robert L. Oetting

Roy A. Palmer

Charles H. Rex

Francis D. Wyatt

ing — such as built-in incandescent and fluorescent units; wide-area luminaire with asymmetric light distribution of specific vapor- and dust-tight types; high- and low-bay luminaires for mercury lamps of all types; and prismatic refractor designs for street lighting applications ranging from residential to heavy traffic, using both filament and mercury sources. He is head of the design department that has developed many technical improvements of great practical importance. Author of papers published in ILLUMINATING ENGINEERING and elsewhere, Mr. Franck has been a member of many I.E.S. Technical Committees and contributed to both the first and second editions of the *IES Lighting Handbook*.

Kasson S. Gibson, Chief of the Photometry and Colorimetry Section, National Bureau of Standards. Dr. Gibson is a world-recognized authority on spectrophotometry, colorimetry and artificial daylight. In 1942 the C.I.E. adopted the internationally accepted relative luminosity curve recommended by Dr. Gibson. He has determined with great accuracy the spectral transmission of international blue-glass filters which afford a practical means for calibrating basic vacuum-tungsten and gas-filled tungsten filament lamp standards against a primary standard of light. He helped to develop filters (adopted by C.I.E.) as means for obtaining C1E Source B, representative of noon sunlight and CIE Source C, representative of average daylight. Dr. Gibson is a Past President of the Optical Society of America and Fellow of the American Physical Society.

John J. Neidhart, Lighting Engineer, Lighting Design Section, Engineering Department, Westinghouse Electric Corp., Cleveland. Mr. Neidhart is well known in I.E.S. circles as the co-originator of the Zonal Method of calculating coefficients of utilization, and the introducer of the Average Brightness concept of specifying and reporting luminaire brightness. He has been member and chairman of I.E.S. Committees on School Lighting and Office Lighting and their subcommittees concerned with brightness and glare. He has contributed numerous technical articles on lighting application techniques and maintenance, particularly in the fields of school and office lighting. During World War II, Mr. Neidhart was responsible for specification, development and testing of infra-red signalling equipment for shipboard use by the U. S. Navy.

Robert L. Oetting, Illuminating Engineer, Application Engineering Department, Lamp Division, General Electric Company, Cleveland. Best known for original work in improving techniques in equipment for office and public building lighting, Mr. Oetting has been influential in the adoption of light desk tops and higher reflectance finishes on typewriters, business machines, etc. As engineer in charge of lighting at Nela Park, he conceived many new application techniques, including combination troffer-luminous ceiling systems. Mr. Oetting was Chairman of the Office Lighting Committee responsible for the preparation of the 1947 edition of the Recommended Practice for Office Lighting, and has for many years been a member of that committee and its subcommittees. He is the Official I.E.S. Representative to A.S.A. Sectional Committee X2 on Office Standards and to the National Office Management Association's Committee on Physical and Psychological Factors. He has published many articles on office lighting in journals of architectural and office management.

Roy A. Palmer, Merchandising and Advertising Manager, Duke Power Company, Charlotte, N. C. Recognized as a pioneer in dissemination of lighting fundamentals and design, Mr. Palmer is also an authority on ultraviolet radiation and fluorescence. He has designed original equipment for the demonstration of fundamentals of lighting design, color pattern projection, polarized light, and has made special studies of fluorescence of organic dyes. Of particular importance is his research on lighting in the textile industry, which has been influential in

the setting of Society and industry recommendations. Mr. Palmer is consultant to the North Carolina Optometric Society and has lectured at the University of North Carolina, Duke University and other institutions. He was a delegate to the International Congress on Illumination in London, in 1931; a member of President Hoover's Commission on Home Building and, during World War II, was a consultant on blackout and dimout for the Southeast. He has served the Society on innumerable committees including a term as Director, and was in large part responsible for the formation of the Carolinas Chapter in 1948.

Charles H. Rex, Development Engineer, Lighting and Rectifier Department, General Electric Company, West Lynn, Mass. The early work of Mr. Rex included field investigations, analysis and evaluation of roadway lighting using traffic engineering as well as illuminating engineering principles, for which increased recognition was obtained for the professional status of these two types of engineering. Mr. Rex designed the first street lighting luminaire which used mercury lamps as efficiently as filament lamps had been used, and the first unit put into production by an American manufacturer for overhead roadway lighting. Mr. Rex was Chairman of the I.E.S. Committee on Street and Highway Lighting which was responsible for the 1952 Recommended Practice, which was adopted in 1953 by the American Standards Association as the American Standard Practice for Street and Highway Lighting. Mr. Rex installed one of the first floodlighting systems for night baseball in Des Moines in 1931, and assisted in the lighting of the Century of Progress in Chicago in 1933-1934. He has contributed developmental work on signalization for pedestrians, pedestrian recall, and three-dial controllers for progressive traffic movement.

Francis D. Wyatt, Electrical Engineer, Chicago Park District, Chicago, Ill. A list of the specific achievements accomplished by Mr. Wyatt begins with the development of aluminum poles for street lighting; the design, construction and development of an illumination laboratory, including photometers, for the Chicago Park District; a new approach to sports floodlighting with his installation at Soldiers' Field in 1946; research on pavement texture and brightness, prior to the formation of I.E.S. Research Fund Project No. 22; design and installation of one of the first mercury and incandescent lighting systems, in Columbus, Ohio in 1935. Mr. Wyatt has served for many years as member and Chairman of the I.E.S. Committee on Street and Highway Lighting and on its subcommittees. In addition to this and other committee activity, notably Sports Lighting, he has been the Society's Official Representative to the President's Highway Conference Engineering Committee and is currently representing I.E.S. on the National Commission on Traffic Safety.

Street Tree and Utility Conference Scheduled for Next March

A jointly-sponsored "Street Tree and Utility Conference" will be held March 3-5, 1955 in Cleveland, Ohio. The conference is under the auspices of the Street and Highway Lighting Committee of I.E.S., the Transmission and Distribution Committee of the Edison Electric Institute and the Shade Tree Section of the National Shade Tree Conference. Chairmen of the three committees are Kirk M. Reid, General Electric Co.; John W. Anderson, Philadelphia Electric Co.; and Edward H. Scanlon, Commissioner of Shade Trees, Cleveland.

The purpose of the conference is to study the need for a long-range program designed to evolve a plan whereby trees and utility installations may harmoniously occupy streets and highways. Considerations of contemporary clearance problems are not germane.

The conference has been enthusiastically endorsed by many of the outstanding City Arborists of the country. Invitations will be extended to all persons and groups interested in the problem, including communication companies, state and municipal foresters, roadside engineers, arborists and nurserymen. The program will be built along the lines of a discussion by each of the three major groups on, first: the "Problem" and the second on the "Solution." Each group will present its needs for giving the best service to the public.

A "diagnosis round table" will conclude the meeting and the facts presented will be summarized by the chairman and round table panel. The papers and summary recommendations will be published in the proceedings of the conference and will be available to those interested.

Store Modernization Clinic Aids Massachusetts Retailers

Newest equipment and methods for modernizing and improving the retail stores of Cambridge, Mass., drew more than 200 store executives, architects and bankers and real estate men to a clinic and exhibition on store modernization last summer, according to the *Negea News*, house publication of the New England Gas and Electric System.

Lighting was duly recognized for the important part it plays in making up-to-date attractive merchandising areas in the program, which contained the following addresses:

Your Store Front Is Your Reputation — Phil Farrell and W. A. Cunningham, Kawneer Co.

The Three "A's" of Store Lighting — L. S. Cooke, General Electric Co., Lamp Department.

Business Looks Up When Your Store Looks Up to Date—R. E. Ferdinand, Joslin Show Case & Fixture Co.

Color Keeps the Cuostmers Coming — R. E. Youlden, The Glidden Co.

I'll Shop Where It's Cooler — Ted Larson, Boston Filter Co.

The Landlord's Viewpoint—Bradlee F. Clarke, real estate.

How You Can Obtain Financing — Robert Duncan, Harvard Trust Co.

Panel chairman was Paul Corcoran, president of the Corcoran Department Stores.

Center Developed for Visual Performance Studies

A Center for Advanced Studies in Visual Performance has been arranged at Northern Illinois College of Optometry for the new school year beginning September 20, according to President Richard Feinberg. A direct function of the new center will be to further studies in school child visual performance and in occupational optometry. These researches will be directed toward optometric student participation as well as toward that of the advanced researcher.

The installation of a model classroom, made possible through a grant given by Dr. D. B. Harmon and Associates, will be the first step in the center's advancement. Construction of the classroom is expected to be completed by the latter part of September and will include exterior glass block wall, modulated chalkboards, color treatment, and air conditioning. One of the features will be a viewing gallery to be erected across one end of the room. A one-way viewing window will be installed, permitting students and others in an adjacent room to observe subjects, undergraduates, instructional staff and research personnel. The center will be utilized by educators,

(*Continued on page* 13A)

Westinghouse lighting equipment for all your applications

. . . FOR PLAYING

This installation at the University of Pittsburgh is a typical multi-purpose arena requiring a flexible lighting system. The Pitt Field House is equipped with removable basketball floor, bleacher sections and is used for varsity and intramural sporting events. 120 Westinghouse *Millites* provide general illumination over the first-floor main area. When the basketball floor is assembled in the center of the gym area, an additional 28 *Millite*® units are energized to increase the illumination level over the playing court.

Architects: Inghome, Boyd & Pratt
Consulting Engineer: E. T. Wieman
Electrical Contractor: Sargent Electric Co.

YOU CAN BE SURE... IF IT'S Westinghouse

. . FOR WORKING

The first requirement for this installation was attractive appearance and adequate illumination for detail office work. Westinghouse *TU Troffers* were selected to fit into the low-ceiling architecture and to enhance the over-all appearance.

Result—an attractive, comfortable and efficient lighting installation.

Architects: Benham, Rickards and Armstrong
Consulting Engineers: John Paul Jones, Carey and Miller
Electrical Contractor: Paul L. Gilmore Co.

. . FOR LEARNING

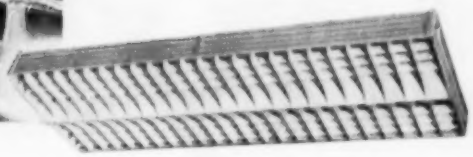
In this school, Westinghouse *CD Luminaires* were selected to achieve high illumination levels with freedom from brightness and glare. With this semi-indirect system, 72% of the light is directed up, making the entire ceiling area a low-brightness light source for the classroom.

Architects: Ebbetts, Frid and Prentice
Consulting Engineers: Hubbard, Lawless, Blakely, Inc.
Electrical Contractor: Albert Anderson

. . FOR SELLING

This retail merchant wanted to increase his sales. Westinghouse *SC Luminaires* were selected to attractively light the merchandise and to compliment the smartly styled interior design. The direct light produced helps his customers see more—and buy more.

Electrical Contractor: Lamb Electric



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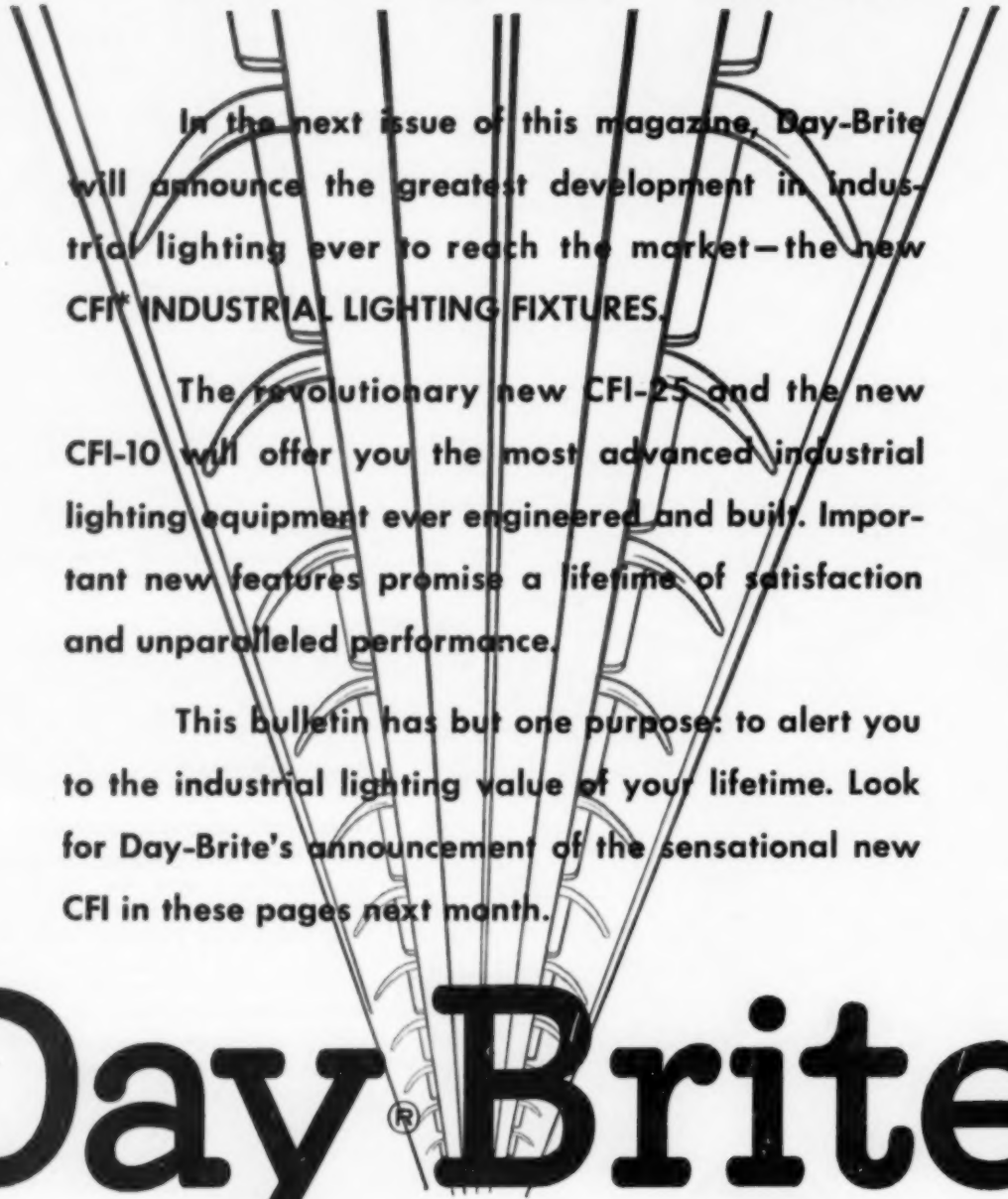
Bulletin



In the next issue of this magazine, Day-Brite will announce the greatest development in industrial lighting ever to reach the market—the new CFI* INDUSTRIAL LIGHTING FIXTURES.

The revolutionary new CFI-25 and the new CFI-10 will offer you the most advanced industrial lighting equipment ever engineered and built. Important new features promise a lifetime of satisfaction and unparalleled performance.

This bulletin has but one purpose: to alert you to the industrial lighting value of your lifetime. Look for Day-Brite's announcement of the sensational new CFI in these pages next month.

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DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

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(Continued from page 9A)

as well as by optometrists, ophthalmologists, psychologists, lighting and color engineers, and others concerned with school and industrial vision.

Education in ocular pathology also will be intensified at the College, stated Dr. Feinberg. The pathology clinic is completely equipped and students are trained to use the various instruments needed in a complete diagnostic procedure. A large amphitheater allows undergraduates to observe the staff ophthalmologist and the optometric staff verify the student's diagnosis and prescribe treatment. Throughout the school year, the senior students are scheduled regularly to view eye surgery at the Illinois Eye, Ear, Nose and Throat Infirmary.

Television has been installed in the Visual Training department for use in research and teaching. The Contact Lens and Sub-Normal Vision departments have been enlarged as more emphasis is being placed upon the care of the visually handicapped. All the facilities of the Clinic's various departments are available to graduate students, optometrists and other vision specialists.

New York Section Presents Annual Illumination Course

A 12-week course in Fundamentals of Illumination is an annual Fall event with the New York Section, and this year course coordinator is R. L. Zahour, Westinghouse Electric Corp. Other lecturers are L. R. Anderson, General Electric Co.; L. Goren, Smithcraft Lighting Division, A. L. Smith Iron Works; and Gene G. Rae, Holophane Co.

The program stresses special attention on current problems and trends, and the subjects are discussed from the practical standpoint of the man in the field. The topics discussed are as follows:

September 20—Theory of Light and Vision: introduction, artificial light, its relation to human eyes, objects and areas; how light can be controlled — R. L. Zahour.

September 27—Illumination Terms: measurement of light and analysis of light distribution curves— R. L. Zahour.

October 4—Incandescent and Mercury Lamps: discussion of lamp types and finishes, characteristics, life expectancy — R. L. Zahour.

October 11—Fluorescent Lamps: characteristics and operation of hot cathode and cold cathode lamps — L. R. Anderson.

October 18—Ballasts, Starters, and Circuitry —description of various types of ballasts and starters; circuitry for hot cathode and cold cathode lamps — L. R. Anderson.

October 25—Equipment Design: basic analysis of materials for control of light; effect of shape and brightness on fixture appearance — L. Goren.

November 1—Lighting Requirements: analysis of visual tasks and the survey, lighting systems, lighting equipment and design — L. Goren.

November 8 — Design of Lighting Installations: design of general lighting systems by average lumen and point-by-point methods — L. Goren.

November 15—Industrial Lighting: discussion including general, local and supplementary lighting for industrial interiors; use of mercury, fluorescent and incandescent lamps — L. R. Anderson.

November 22—Store and Window Lighting: commercial lighting, store, window and display; discussion of appraisal and atmosphere — G. G. Rae.

November 29 — School and Office Lighting: lighting requisites, quality, and quantity, contributing factors; layouts and problems; general maintenance procedures — G. G. Rae.

December 6 — Economics of Lighting and Maintenance: factors entering into cost computation of a lighting system; owning and operating costs — G. G. Rae.

Classes, from 6:30 to 8:00 Monday evenings, are held in Room 815, Consolidated Edison Building, 4 Irving Place in New York City. Tuition fee is $10 for members of I.E.S., A.I.E.E. and A.I.A.; $20 for all others. Enrollments should be sent to R. E. Faucett, Electrical Testing Laboratories, 2 East End Ave. at 79th St., New York 21.

(Continued on page 14A)

LIGHTING CALENDAR

Society Events

September 13-17, 1954—Illuminating Engineering Society, National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

March 31 - April 1, 1955 — Southern Regional Conference, Ft. Harrison Hotel, Clearwater, Fla.

April 3-5, 1955 — Southwestern Regional Conference, Gunter Hotel, San Antonio, Texas.

April 11-13, 1955 — Inter Mountain Regional Conference, Phoenix, Arizona.

April 14-15, 1955 — South Pacific Coast Regional Conference, Statler Hotel, Los Angeles, Calif.

April 25-26, 1955 — Pacific Northwest Regional Conference, Vancouver, B. C.

May 2-3, 1955 — Midwestern Regional Conference, Edgewater Beach Hotel, Chicago, Ill.

May 12-13, 1955 — Canadian Regional Conference, Hotel Mount Royal, Montreal, Que.

June 10-11, 1955 — Northeastern Regional Conference, Ft. William Henry Hotel, Lake George, N. Y.

Industry Events

September 1-16, 1954—International Electrotechnical Commission, Golden Jubilee Meetings, University of Pennsylvania, Philadelphia, Pa.

September 22-24, 1954—Canadian Electrical Manufacturers Association, Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

September 23-25, 1954 — International Association of Electrical Inspectors, Northwestern Section, Portland, Oregon.

September 27-30, 1954—Institute of Traffic Engineers, Annual Meeting, Hotel Muehlbach, Kansas City, Mo.

September 29 - October 2, 1954 — International Association of Electrical Leagues, Bellevue Stratford Hotel, Philadelphia, Pa.

October 3-6, 1954 — National Association of Electrical Distributors, Pacific Zone Convention, Mark Hopkins Hotel, San Francisco, Calif.

October 4-6, 1954 — National Electronics Conference, Inc., Hotel Sherman, Chicago, Ill.

October 4-6, 1954 — International Association of Electrical Inspectors, Canadian Section, Ontario Chapter, King Edward Hotel, Toronto, Ontario, Canada.

October 11-13, 1954 — International Association of Electrical Inspectors, Western Section, Louisville, Ky.

October 11-15, 1954—American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill.

October 17-22, 1954—Society of Motion Picture and Television Engineers, Semi-annual Convention, Los Angeles Ambassador, Los Angeles, Calif.

October 18-22, 1954 — 42nd National Safety Congress & Exposition of the National Safety Council, Chicago, Ill.

October 24-27, 1954 — Board of Governors, National Association of Electrical Distributors, Hershey Hotel, Hershey, Pa.

October 25-27, 1954—International Association of Electrical Inspectors, Southern Section, Tampa Terrace Hotel, Tampa, Fla.

October 27-30, 1954 — National Electrical Contractors, Annual Convention, Jung Hotel, New Orleans, La.

November 8-11, 1954 — National Electrical Manufacturers Association, Haddon Hall Hotel, Atlantic City, N. J.

November 15-17, 1954 — American Standards Association, 5th National Conference on Standards and 36th Annual Meeting, Hotel Roosevelt, New York, N. Y.

November 16-19, 1954 — National Farm Electrification Conference, Schenectady, N. Y.

November 28 - December 3, 1954 — The American Society of Mechanical Engineers, Annual Meeting, Statler Hotel, New York, N.Y.

January 7-11, 1955 — National Retail Industry Show, Madison Square Garden, New York, N. Y.

January 31 - February 4, 1955 — American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York, N. Y.

March 13-18, 1955 — National Electrical Manufacturers Association, Edgewater Beach Hotel, Chicago, Ill.

June 27 - July 1, 1955 — American Institute of Electrical Engineers, Summer General Meeting, New Ocean House, Swampscott, Mass.

East Central Region Solves M.M.I.L.J. Contest Problem

How does the I.E.S. Region which has no Regional Conference pick its regional winner for the My Most Interesting Lighting Job contest? This question has stumped regional contestants every year.

The Region which is host to the National Conference doesn't hold a Regional Conference. With the National meeting in Atlantic City, East Central Region found itself with five contestants, and no conference to feature their contest. Here's how they solved the problem.

An extra-curricular Section meeting was called in Philadelphia, to which travelled all of the contestants plus a panel of judges made up of one man from each of the Region's Sections and Chapters. Chairman of this special meeting was the Region's Contest Chairman, W. P. Graham. Some 50 people attended to see the presentations, in addition to the out-of-town delegations from five different Sections. Entries were:

Philadelphia Section (first prize) J. J. Tynan.

Pittsburgh Section (second) H. S. James.

Eastern Pennsylvania Section (third) Charles J. Hartman.

Maryland Section, H. Dean Wolfe.

Capital Section, Albert Fox.

Judges who went to Philadelphia for the special contest meeting were: Ray P. Teele (Capital); F. M. Pyle (proxy for Eastern Pennsylvania); C. P. Newbrough (Maryland); Percy Holmes (Philadelphia); A. Paulus (Pittsburgh).

Findings Reported by Special Studies On Plastics for Lighting

Answers to a number of posers in the "plastics for lighting" field are being sought by several subcommittees of the Plastics for Lighting Committee sponsored jointly by I.E.S. and the Society of the Plastics Industry. Two of these subcommittees have now reported the results of their studies to the main committee.

One report results from answers to a questionnaire to the entire fixture manufacturing field, to determine environmental and operational requirements of plastic in fluorescent luminaires and area lighting. The other report, by the Subcommittee on Measurements deals with test methods for measuring: accelerated aging (of plastics), light transmission, dimensional stability, hiding power, thermal stability.

Another study, on maintenance of plastics in lighting, is now underway and its report is expected to be completed by late Fall.

Completion of these several studies, manned jointly by lighting engineers and plastics experts, is expected to result in information of value to both fields. The joint I.E.S.-S.P.I. Committee is under the chairmanship of Eric H. Church, Benjamin Electric Manufacturing Co., Des Plaines, Ill.

Occupational Vision Workshop Planned at Georgia Tech

"Shirt-sleeves" ideas of industrial executives and the concepts of professional people will be discussed at the Sixth Occupational Vision Workshop to be held at the Georgia Institute of Technology, November 18.

Participants will include representatives of organizations from the fields of management, workers, industrial optometry, industrial ophthalmology, industrial nursing, architecture, safety, industrial and illuminating engineering. The Georgia Section of I.E.S. is being represented by members Harry Y. Yopp and J. B. Browder on the workshop planning committee.

Highlighting the session will be the recognition to be given to six Southern industrial concerns whose vision programs have been designated by the Southern Occupational Vision Council as outstanding in at least one way. Top executives will relate how their firm did it. Each profession will thumbnail its interest in vision and outline its service as background for the presentation.

Colonel Lambdin Kay, Atlanta, of the Associated Industries of Georgia is president of the sponsoring Southern Occupational Vision Council. N. F. Stambaugh, architect, is vice-president, and R. E. Eskew of Georgia Tech is secretary-treasurer.

Farm Lighting Campaign Scheduled by E.E.I.

"Be Modern — Light Up the Farm" is the theme of Edison Electric Institute's nationally-coordinated farm lighting campaign, scheduled for September, October and November. Behind the campaign is a series of studies showing that farm lighting electricity use is 50 per cent behind urban residential lighting.

The announcement packet consists of eight brochures, mailers and advertising kits for participating company use, in addition to the Plan for Action, which outlines the goals of the campaign and specific ways to utilize the materials.

Special Exhibit Features Use of Glass in Lighting

The contribution of glass in the development of lighting during the past 75 years is the subject of a special exhibition, recently opened in the Hall of Science and Industry at the Corning Glass Center, Corning, N. Y. The exhibit is a feature of Corning Glass Works' observance of Light's Diamond Jubilee. It will be open to the public without charge until the end of the year.

The exhibit includes five major points of interest:

(1) A display by the Corning Museum of Glass of early lighting implements, ranging from the earliest known types to the massive bronze lamps of the Greco-Roman period.

(2) A display of 15 original incandescent lamps from the Henry Ford Museum and Greenfield Village. These pieces trace the major steps in the development of the incandescent lamp.

(3) A revolving spiral display, eight feet high, which presents all basic types of glass bulb blanks produced today by Corning for the lighting industry. It is topped by one of the 75,000-watt bulb blanks made this year.

(4) Push-button exhibits of shades, reflectors and lenses which further develop the usefulness and efficiency of incandescent and fluorescent lamps.

(5) An abstract three-dimensional work of art in neon tubing, seven feet high, entitled "Glass and Electricity — A Symbol in Progress of Light." The 25 pieces of neon tubing which make up the symbol were drawn in Corning plants.

The exhibit was developed and set up by Howard E. Bahr, director of displays and exhibits for the company.

Industry Seminar Attended By College Professors

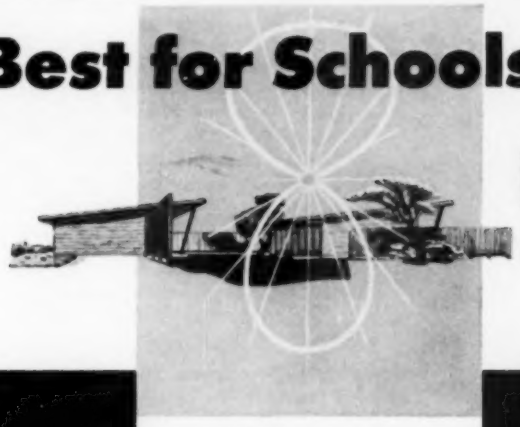
A week-long industry seminar began August 16 at the Westinghouse Educational Center, Pittsburgh, Pa., for 37 college professors and instructors, most of whom have been working since mid-June at plants of Westinghouse Electric Corp. as part of an annual industrial experience program.

Assigned to positions in various operating divisions of the company have been 23 educators from leading U. S. colleges. During the seminar they were joined by 14 others. In addition to the engineering field, the list includes teachers in economics and English.

Theme of the seventh annual seminar was "New Horizons." Panel discussions reviewed problems of present day engi-

(*Continued on page* 16A)

Best for Schools glare-free fluorescent...nearest to daylight



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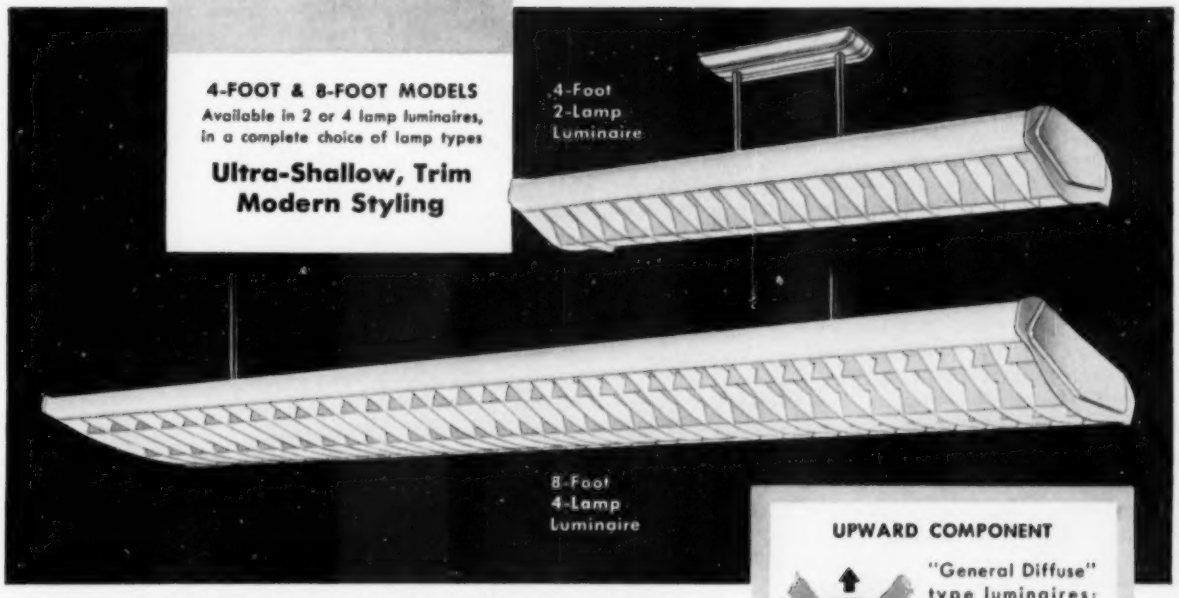

modern lighting planned for today's schools—superior illumination with low cost maintenance

MITCHELL engineering perfects a new standard for school lighting. The "LODESTAR" Luminaire offers abundant light distribution with an absence of glare to approximate daylight conditions. This important lighting advance is attained by the substantial upward component with its "general diffuse" lighting effect, the semi-translucent side panels with pleasing low brightness contrast, and the superior louver design (35°/25°* cutoff) which delivers properly shielded illumination to working areas. Smooth styling, very low maintenance factor and surprisingly low cost make the MITCHELL "LODFSTAR" Luminaires the wisest choice for School Lighting.

**Also available with 35°/45° shielding.*

UPWARD COMPONENT

"General Diffuse" type luminaires; approximately half the light goes up to be reflected from ceiling or upper walls for comfortable, glare-free, uniform lighting.

SEMI-TRANSLUCENT SIDES

Provides low brightness contrast, creating modern streamlined appearance. Plastic sides and louver are one easy-to-handle unit.

where quality counts *SPECIFY*

MITCHELL

MITCHELL MANUFACTURING COMPANY
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Send full data on MITCHELL "Lodestar" Luminaires.

Name.....

Firm.....

Address.....

City.....Zone...State.....

(Continued from page 14A)

neering developments, the effects of which are beginning to be felt in industry and education. George E. Moore, manager of university relations for Westinghouse, explained the program as one to strengthen relationships with educational institutions by acquainting their teachers with problems confronting industry. "We review these problems and acquaint the participants with our philosophy and efforts in developing to the utmost the potential of the young graduate in industry," Mr. Moore said.

In addition to the discussions, top officials of the company discuss training of engineers, evaluation of industrial training and similar topics. Tours of plants in the Pittsburgh area were also conducted.

The teachers who have been at company installations since June are concluding their work about the middle of September. The list of schools varies each year in order that greater participation may be obtained from various sections of the country. Ninety-six schools have sent representatives to the summer-long program during the seven sessions that have been held.

Samuel B. Williams Retires, I.E.S. Past-President

S. B. Williams, President of the I.E.S. 1944-1945, retired from business August 31st. He was Assistant to the Chairman of the Board of Directors of Sylvania Electric Products, Inc., New York City, which company he joined in 1947. Mr. Williams plans to live in Jamestown, Rhode Island, where he will establish a consultation practice in corporate management and public relations.

Mr. Williams has been a widely known figure in the electrical manufacturing field for many years. After graduating from Princeton University in 1912, he received a degree in Electrical Engineering from Princeton in 1914. He went immediately into the electrical publishing business, serving on the editorial staff of *Electrical World* from 1914 to 1922, managing editor and editor of *Electrical Record* from 1922 to 1924, editor and manager of *The Electragist* from 1924 to 1928, and editor and general manager of *Electrical Contracting* from 1928 to 1936. Called back to *Electrical World*, a McGraw-Hill publication, he became managing editor in 1936 and editor from 1937 to the time he joined the Sylvania organization.

In 1949 Mr. Williams was appointed Sylvania's Director of Public Relations. In 1952 he became Assistant to the President, and last year was named Assistant to the Chairman of the Board. He has

Samuel B. Williams

been Sylvania's executive member of N.E.M.A. and was chairman of the Planning Committee which organized N.E.M.A.'s National Lighting Bureau.

Mr. William's contributions to I.E.S. progress have been equally note-worthy. In addition to serving the Society in Council and as its top executive, he has served on numerous important national committees. He is currently a member of the Committee on Public Relations and Information. Mr. Williams is also a member of the United States National Committee of the Commission Internationale de l'Eclairage and the Advisory Committee of the Society for the Prevention of Blindness.

ABOUT PEOPLE

Arthur A. Brainerd, Fellow of the I.E.S., and the President of the United States National Committee of the C.I.E., was recently awarded the honorary degree of Doctor of Engineering, by his alma mater, Ohio University. The degree was presented in recognition of his many contributions to illuminating engineering. Mr. Brainerd has just celebrated his 30th anniversary with the Philadelphia Electric Company.

Col. H. F. Sykes, Jr. assumed Command recently of the main research center of the Corps of Engineers, the Engineer Research and Development Laboratories at Fort Belvoir, Va.

Joseph F. Miller has been appointed assistant managing director of the National Electrical Manufacturers Association, succeeding **Norman Wicks** who has been appointed manager of the Business Development Department.

John C. Virden, Jr., John C. Virden Co., has been re-elected president of the American Home Lighting Institute, Chicago; and **Alfred Rosenblatt,** Globe Lighting Co., has been re-elected secretary. **James Wiedemar,** Phil R. Hinkley Co., and **Eugene Berman,** Leader Lamp Mfg. Co., were both elected to a three-year term on the Board of Governors.

Robert T. Sutherland, Jr., Captain USN (Retired), has been named President of Starring & Co., Inc., of Bridgeport, Conn., it has been announced by D. Swing Starring, Chairman of the Board.

R. M. Johannesen, president of the National Association of Electrical Distributors for the year 1953-1954, delivered the President's Address at the organization's 46th Annual Convention in Atlantic City, N. J., June 6-11. Mr. Johannesen, president of Johannesen Electric Co., in Greensville, N. C., is also an active member of the I.E.S. Carolinas Section. The election of **Lester E. Barrett,** president of Barrett Electrical Supply Co., St. Louis, was announced at the meeting. Mr. Barrett presented to Mr. Johannesen a memento of his term of office in the form of an inscribed gavel.

E. Finley Carter, vice-president and technical director of Sylvania Electric Products Inc., has accepted the position of manager of research operations of Stanford Research Institute. Assuming his duties with the Institute October 1, Mr. Carter will supervise the three research divisions carrying the main programs and projects—Physical Sciences, Engineering and Economics. He will retain his association with Sylvania, assisting in contacts with the Defense Department and consulting on major research and development contracts.

Hans K. Rosenthal has joined Cutler Electrical Products, Inc., in an executive capacity. Mr. Rosenthal will be in charge of the Cold Cathode Lighting Division at the new factory and offices of the company at 5524-30 Haverford Ave., Philadelphia. The appointment was also announced of **Sal A. Caniglia** as Vice-President in charge of sales of Cutler Electrical Products.

W. E. M. "Don" Walsh, 2407 Marietta Ave., Montreal, has joined the Wakefield Lighting Limited, London, Ont., sales staff as Quebec sales representative with headquarters in Montreal. Mr. Walsh has previously been associated with the Northern Electric Co., and Canadian Westinghouse Supply Co.

James R. Maher has been appointed Traffic Manager of Benjamin Electric

(Continued on page 19A)

Completely new—
PC Suntrol Blocks
take the dazzle
out of sunlight!
Pittsburgh Corning expands its line of 12-inch functional glass blocks with a group of totally new patterns known as Suntrol. Available in light-directing, light-diffusing and toplighting patterns, these blocks are expressly designed for locations where heat and glare are a problem. Suntrol Blocks contain a pale green fibrous glass diffusing screen that reduces panel brightness by 35%.
Suntrol Blocks do not replace the present line of PC Functional Glass Blocks. But for special applications, Suntrol Blocks will reduce glare, reduce instantaneous heat gain, and give more human comfort than ever before.
Descriptive literature is now on the press. Write to Pittsburgh Corning Corporation, Dept. CA-94, One Gateway Center, Pittsburgh 22, Pa. Ask for the Suntrol booklet.
PC Suntrol Glass Blocks
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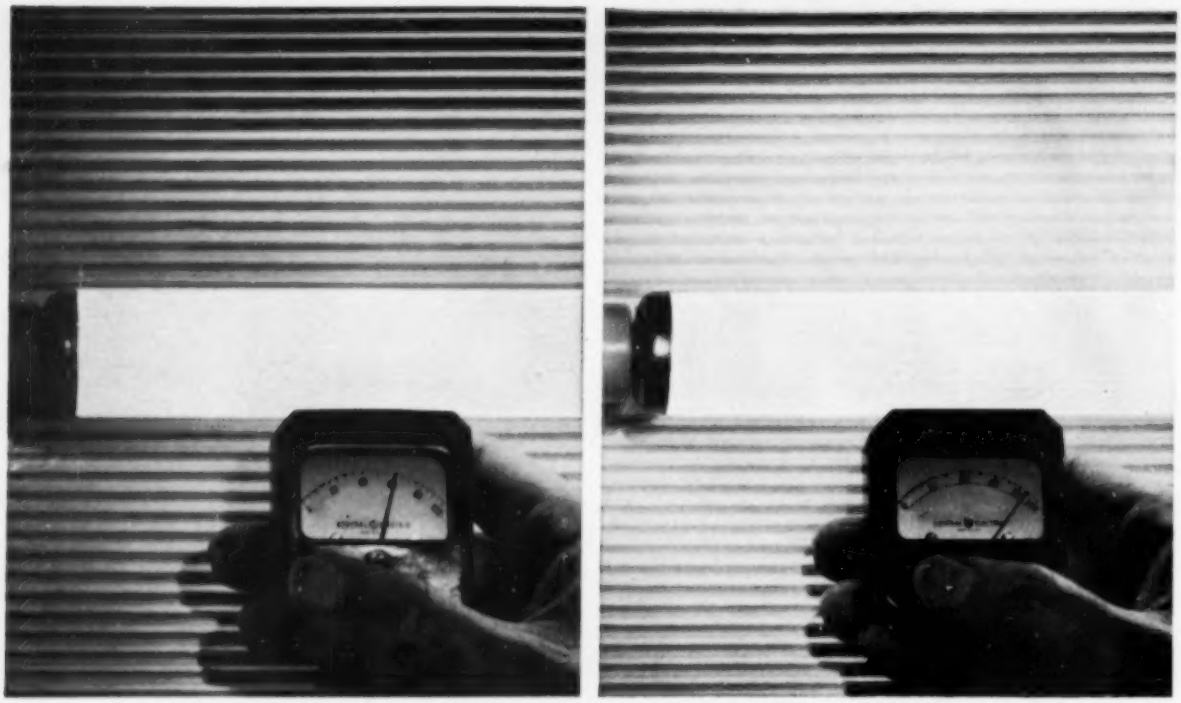
PC
CORNING
ALSO SKYTROL® AND FOAMGLAS®
* PC Trade Mark



Regular slimline, left, gives 620 units of light. New High Output Rapid Start lamp, right, gives 840 units of light.

NEW GENERAL ELECTRIC FLUORESCENT LAMP GIVES ⅓ MORE LIGHT THAN ANY PREVIOUS FLUORESCENT

LIGHTS ALMOST INSTANTLY—General Electric announces the most important advance in fluorescent lighting in 10 years: the new High Output Rapid Start fluorescent lamp. The 96-inch High Output lamp gives 36% more light than the most powerful G-E fluorescent lamp previously available.

For new installations, General Electric High Output lamps offer this ⅓ bonus of light without increasing the number of fixtures or maintenance costs.

This big increase in light, with no increase in lamp size, has been achieved through a special cathode developed by General Electric which permits a boost in lamp wattage to 100. Because the cathode is of the famous General Electric triple coil design, these Rapid Start lamps light up almost instantly. General Electric High Output lamps have a rated life of 7,500 hours, the same as all General Electric general lighting fluorescent lamps.

A new G-E base and socket design protects the lamp contacts by recessing them. A simple push-pull sets the lamp in its fixtures.

HAS VARIETY OF USES

The new General Electric High Output fluorescent lamp is especially suited for use in areas with high ceilings, in factories, warehouses, offices and stores. Also in store windows, showcases and other places where you want higher lighting levels in keeping with the modern trend. New fixtures designed for the G-E High Output lamp will soon be available from a number of lighting fixture manufacturers.

For information, write to Lamp Division, General Electric Company, Dept. 166-IE-9, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

(Continued from page 16A)

Manufacturing Co., Des Plaines, Ill. Mr. Maher had previously been with the Illinois Central Railroad, the Post Office Department, and General Motors Corp.

Wallace R. Wirths has joined the Public Relations Department of Sylvania Electric Products Inc. at the company's executive offices in New York. Mr. Wirths was formerly a public relations manager for the Aluminum Company of America.

The formation of the Chemical and Metallurgical Division within the General Electric Co. has been announced, with **Robert L. Gibson** appointed as general manager. Mr. Gibson will make his headquarters in Pittsfield, Mass.

William R. Sears has been appointed Pacific Coast Manager of Sales Promotion and Publicity for Sylvania Electric Products Inc. He will have offices at 215 Market St., San Francisco. Mr. Sears had joined Sylvania as field representative in 1952 at Emeryville, Calif.

A John Price Wetherill Medal will be awarded to **William D. Buckingham**, Western Union Telegraph Co., by the Franklin Institute of the State of Pennsylvania. The Medal, which was awarded for a discovery or invention in the physical sciences, will be given Mr. Buckingham at the Institute's annual Medal Day exercises, October 20. With the award is a citation which reads "In consideration of his invention of the Zirconium Concentrated-Arc Lamp, a device capable of producing a high intensity, sharply defined, extremely small beam of light and with modulation characteristics heretofore unobtainable in practical devices."

Fenn C. Horton, Sr., for six years manager of the Iowa-Illinois Sales District of General Electric's Lamp Division, at Davenport, Iowa, resigned his position August 1. Mr. Horton will continue with the district as a consultant until his retirement under provisions of the company's pension plan on February 1, 1955. Succeeding him as manager of the district is **Robert E. Hixson**, who for the past three years was a member of the Sales Operation staff at division headquarters, in Cleveland.

Joseph F. Kempf, Jr., has been named manager of the Lake Erie District of the Westinghouse Lamp Division, succeeding L. W. Aukland. In his new position, Mr. Kempf will direct sales activities in northeastern Ohio, with headquarters at the company's Cleveland offices.

I.E.S. Regional Conferences—1955

(Tentative Schedule)

Southern	Fort Harrison Hotel Clearwater, Florida	March 31-April 1
Southwestern	Gunter Hotel San Antonio, Texas	April 3-5
Inter-Mountain	Phoenix, Arizona	April 11-13
South Pacific Coast	Statler Hotel Los Angeles, California	April 14-15
Pacific Northwest	Vancouver, British Columbia	April 25-26
Midwestern	Edgewater Beach Hotel Chicago, Illinois	May 2-3
Canadian	Mount Royal Hotel Montreal, Quebec	May 12-13
East Central	To be announced	May ———
Northeastern	Fort William Henry Hotel Lake George, New York	June 10-11

Decorators Exhibit— At Home in America 1954

Eighteen chapters of the American Institute of Decorators participated in the exhibition "At Home in America, 1954," held from June 24 to July 1 at the Palmer House, Chicago.

Each chapter decorated a room in a style familiar in its own area, and in some cases called in lighting experts to supply the technical knowledge needed in that field.

What They Said When Edison Invented the Electric Light

With the celebration, this year, of Light's Diamond Jubilee there is a great deal of publicity about Thomas Edison's invention of the electric light and the electrical progress it started. Today there is nothing but favorable comment on Edison's invention, but this was not true in 1879. Then he was both hailed and derided, and his lamp was considered by some as a fraud on the public gullibility.

Although the first phase of Edison's experiments on the incandescent lamp was successfully complete on October 21, 1879, there was no publicity at the time. Several years earlier Edison had lost a patent battle because, he thought, of premature publicity. Therefore he wanted to hold the news of his invention of the electric light until he could protect his patent rights. Furthermore, he wanted to put on a demonstration of his light and his generation and distribution system that would completely convince both the public and the scientific world of its practicability.

He planned to make this demonstration in January 1880 by a complete electrification of his village of Menlo Park. To do this he had to build generators, string wires, make hundreds of light bulbs, fashion fixtures, make sockets and switches. In short, he had to build a complete electrical system. He and his associates were hard at work on this when the publicity storm broke.

Marshall Fox, a reporter for the *New York Herald*, was a friend of Edison's. At some time after October 21 Edison talked to him freely about the light, gave him thorough and detailed explanations of every step of the experiments, furnished him with diagrams.

Fox broke the story on Sunday, December 21, in an account that ran for a full six-column page (without advertising) and for a column on the next page. The story was detailed and specific and contained ten diagrams. Tradition has it that the story was considered so fantastic that the *Herald's* editor threatened to fire Fox.

The reaction came immediately. On Monday, December 22, the *New York Sun* printed a one-column condensation of the *Herald* story and added a letter written the day before by an "electrician" named W. E. Sawyer.

Sawyer started out by stating that

(Continued on page 42A)

SUSTAINING MEMBERS

Acme Electric Corp.
Cuba, N. Y. *J. A. Comstock*

Advance Transformer Company
1122 W. Catalpa Ave., Chicago 40, Ill.
A. E. Feinberg

Alabama Power Co.
Birmingham, Ala. *George L. Morris*

Aluminum Company of America
Gulf Building, Pittsburgh 19, Pa. *C. Braglio*

Amalgamated Electric Corp., Ltd.
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W. A. Dalrymple

American Concrete Corp.
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J. W. Lewis

American Fluorescent Corp.
1234 N. Paulina St., Chicago 22, Ill.
William Rusnak

American Sterilizer Co.
Erie, Pa. *Horace Wm. Alexander*

Appleton Electric Co.
1701-1729 Wellington Ave., Chicago 13, Ill.
Nils A. Tornblom

Arkansas Power & Light Co.
Little Rock, Ark. *Max Sudduth*

The Art Metal Co.
1814 E. 40th St., Cleveland 3, Ohio
George E. Glatthar

Atlantic City Electric Co.
1600 Pacific Ave., Atlantic City, N. J.
John B. Taylor

B M D and R Inc.
7020 Walker St., St. Louis Park
Minneapolis 16, Minn. *Cecil H. Branham*

Barrett Division
Allied Chemical & Dye Corp.
P.O. Box 27, Station 1
Toledo 14, Ohio. *Dr. M. H. Bigelow*

Benjamin Electric Mfg. Co.
Des Plaines, Ill. *Benjamin S. Benson*

Black & McDonald Limited
200 King Street W., Toronto, Ont., Canada.
W. J. McDonald

Blue Ridge Glass Corp.
Kingsport, Tenn. *James Herbert*

Board of Water and Electric Light Commissioners
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Lansing 3, Mich. *John D. Malnight*

Boston Edison Co.
39 Boylston St., Boston 12, Mass. *R. B. Brown, Jr.*

British Columbia Electric Rwy. Co., Ltd.
570 Dunsmuir St., Vancouver, B. C., Canada
H. N. Walters

Brockton Edison Co.
36 Main St., Brockton 67, Mass. *W. A. Forbush*

California Electric Power Co.
P.O. Box 512, Riverside, Calif. *Robert W. Dowd*

Calpo Products Co.
5420-28 Paschall Ave., Philadelphia 4, Pa.
Paul C. Calisi

Cambridge Electric Light Co.
Cambridge 39, Mass. *James L. Corrigan*

Canadian General Electric Co., Ltd.
Industrial Products Division
212 King St., Toronto, Ont. *R. M. Love*

Canadian General Electric Co., Ltd.
Lamp Division
165 Dufferin St., Toronto, Ont. *E. H. Lindsay*

Canadian Laco Lamps, Ltd.
745 Guy St., Montreal, Que. *J. Thomas*

Canadian Line Materials, Ltd.
Postal Station H., Toronto 13, Ont., Canada
L. E. Messinger

Canadian National Exhibition Association
Exhibition Park, Toronto, Ont. *H. E. McCallum*

Canadian Westinghouse Supply Co. Ltd.
195 Fleet St., Toronto, Ont., Canada *E. N. Bowles*

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Chicago 14, Ill. *Claude E. Canning*

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St. Charles, Ill. *Rudolph C. Hultgren*

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Central Illinois Public Service Co.
607 E. Adams St., Springfield, Ill. *B. L. Palm*

Central Louisiana Electric Co., Inc.
P.O. Box 1096, Lafayette, La. *J. R. Gaugler*

Central Maine Power Co.
9 Green St., Augusta, Maine *Roland W. Hess*

Central Power & Light Co.
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James M. Williams

Champion Lamp Works Div. of Consolidated Electric Lamp Co.
600 Broad St., Lynn, Mass. *Ellery H. Raddin*

Cincinnati Gas & Electric Co.
Fourth & Main Sts., Cincinnati 1, Ohio
J. R. Hartman

City of Burbank, California Public Service Dept.
164 W. Magnolia Boulevard, Burbank, Calif.
Ralph Foy

City of Glendale Public Service Dept.
119 N. Glendale Ave., Glendale 6, Calif.
L. W. Grayson

City of Riverside Light Dept.
P.O. Box 826, Riverside, Calif. *A. J. Kennedy*

City of Seattle, Dept. of Lighting
1015 Third Ave., Seattle 4, Wash. *P. C. Spowart*

City of Tacoma
Dept. of Pub. Util., Light Div.
PO Box 1639, Tacoma 1, Wash. *Roy H. Weston*

The Cleveland Electric Illuminating Co.
75 Public Square, Cleveland 1, Ohio
R. C. Hienton

Clyde Porcelain Steel Corp.
2211 Birdseye St., Clyde, Ohio *W. F. White*

C. W. Cole & Co., Inc.
329 E. 12th St., Los Angeles 15, Calif.
Russell W. Cole

Colonial Premier Corp.
466 W. Superior St., Chicago 10, Ill.
Richard Weis

Columbia Electric & Mfg. Co.
Box 2180, Spokane, Wash. *Walter A. Toly*

Commercial Light Co.
841 W. Washington Blvd., Chicago, Ill.
Michael R. Fine

Commonwealth Edison Co.
72 W. Adams St., Chicago 90, Ill.
G. K. Hardacre

Compco Corporation
2251 W. St. Paul, Chicago 47, Ill.
Lawrence H. Wrobel

Connecticut Light & Power Co.
P.O. Box 2010, Hartford 1, Conn. *A. M. Wade*

Consolidated Edison Co. of N. Y., Inc.
4 Irving Place, New York 3, N. Y. *C. Miller*

Consolidated Gas, Electric Light & Power Co. of Baltimore
100 W. Lexington St., Baltimore 1, Md.
M. C. Albrittain

Consumers Power Co.
212 Michigan Ave. W., Jackson, Mich. *D. E. Karn*

Consumers Public Power District
1452 25th Ave., Columbus, Nebr. *W. H. Sinke*

Continental Electrical Construction Co.
3540 Southport Ave., Chicago 13, Ill. *Leo W. Witz*

Corning Glass Works
Corning, N. Y. *A. S. Tyler*

Coyne Electrical School, Inc.
500 So. Paulina St., Chicago 7, Ill. *John Hanan*

Crouse-Hinds Co.
Syracuse 1, N. Y. *A. H. Clarke*

Crouse-Hinds Co. of Canada, Ltd.
7 Labatt Ave., Toronto, Ont. *F. R. Jeffery*

Curtis Lighting, Inc.
6135 W. 65th St., Clearing Station
Chicago 38, Ill. *Darwin Curtis*

Curtis Lighting of Canada, Ltd.
195 Wicksteed Ave., Leaside, Toronto 12, Ont.
H. L. Wright

Cutler Light Manufacturing Co.
2026-28 N. 22nd St., Philadelphia 21, Pa.
Robert T. Cutler

Dallas Power & Light Co.
1506 Commerce St., Dallas 1, Texas *W. G. Moore*

Day-Brite Lighting, Inc.
5401 Bulwer St., St. Louis 7, Mo. *D. J. Biller*

The Dayton Power & Light Co.
25 No. Main St., Dayton, Ohio *H. S. Nonneman*

Dazor Manufacturing Corp.
4483 Duncan Ave., St. Louis 10, Mo. *P. L. Read*

Delaware Power & Light Co.
600 Market St., Wilmington 99, Del.
W. A. F. Pyle

Dept. of Water & Power, City of Los Angeles
Box 3669, Terminal Annex, 207 So. Broadway
Los Angeles 54, Calif. *Ivan L. Bateman*

Detroit Edison Co.
2000 Second Ave., Detroit 26, Mich. *L. E. Taylor*

Detroit Electrical Contractors Association
940 Book Building, Detroit 26, Mich.
Carl J. Schoeninger

Detroit Steel Products Co.
2250 E. Grand Blvd., Detroit 11, Mich.
W. Clifton Randall

E. I. duPont de Nemours & Co., Inc.
(Fabrics & Finishes Div.)
Wilmington 98, Del. *S. W. Quisenberry*

E. I. duPont de Nemours & Co., Inc.
Polychemicals Dept.
Development and Service Section
Wilmington 98, Del. *Henry Peterson*

Duquesne Light Co.
435 Sixth Ave., Pittsburgh 19, Pa. *G. W. Ousler*

Duray Fluorescent Mfg. Company
3518 W. Montrose Ave., Chicago 18, Ill.
Ludwig Dannenberg

Duro Test Corp.
2321 Hudson Blvd., North Bergen, N. J.
James L. Cox

Eastern Fixture Co., Inc.
170 Vernon St., Boston 20, Mass. *Louis Gilman*

(*Continued on page 23A*)

(*Note:* Names of Official Representatives appear in italics.)

SUNBEAM LIGHTING; A WISE INVESTMENT, A REAL SAVINGS!

You owe it to yourself and your client to make every lighting dollar count. Experience shows over and over again that a wise initial investment leads to many savings in the long run. Quality can be reasonably priced but it cannot be compromised. Invest in planned lighting and in SUNBEAM lighting fixtures which are scientifically designed to produce efficient, effective and comfortable illumination. Invest and save in SUNBEAM Visionaires of quality construction and for long-period, minimum maintenance.

The First National Bank at Santa Fe, New Mexico wisely invested in and installed over 200 Sunbeam #5602-4BRS recessed units equipped with curved Controlenses®. Mounted at a height of 25 feet (which is a challenge for good lighting) in an attractive pattern, the light output is controlled for maximum, glare-free illumination in the important work zones. Specially engineered for top servicing in this installation, the units will save many dollars in easier maintenance. Sunbeam lighting engineers will gladly, and without obligation show where lighting dollars may be saved on your lighting projects.

SUNBEAM visionaire LIGHTING COMPANY

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Leading organizations in every field of endeavor are specifying Ruby-Philite today to gain maximum efficiency from their lighting installations. They have found that Ruby-Philite luminaires provide desired levels of illumination with a minimum of distracting glare or brightness . . . often at substantial savings realized thru higher luminaire efficiency and lower installation costs. You, too, will find it easier to make your buildings come alive with proper lighting when you specify Ruby-Philite. Write now for complete catalog data.

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(Continued from page 20A)

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M. A. Kremer

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Enterprise Electric Co.
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Esty Manufacturing Company
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Ben Trossman

Fitchburg Gas & Electric Light Co.
557 Main St., Fitchburg, Mass. *A. G. Neal*

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Fluorescent Fixtures of Calif.
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Ernest O. Anders

Fluores-O-Lite Co.
Evans Terminal, No. Broad St., Hillside, N. J.
Meyer H. Silverman

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Fostoria, Ohio *E. L. Bates*

H. A. Framburg & Co.
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Stanley A. Framburg

The France Mfg. Co.
10325 Berea Rd., Cleveland 2, Ohio *E. L. Walter*

Franklin Design Service
Division of Safeway Stores, Inc.
4th & Jackson Sts., P.O. Box 660
Oakland 4, Calif. *T. E. Rinehart*

The Frink Corporation
27-01 Bridge Plaza North
Long Island City, N. Y. *Theo. J. Brassel, Jr.*

Fullerton Manufacturing Corp.
17 Chestnut St., South Norwalk, Conn.
Lawson Fullerton

Gallagher-O'Brien Electric Co., Inc.
915 W. North Ave., Chicago 22, Ill.
Frank A. Gallagher

Garden City Plating & Mfg. Co.
1750 No. Ashland Ave., Chicago 22, Ill.
G. G. Harney

General Electric Co., Apparatus Dept.
River Works, 920 Western Ave.
West Lynn, Mass. *W. J. Fleming*

General Electric Co., Lamp Dept.
Nela Park Cleveland 12, Ohio *Willard C. Brown*

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General Fireproofing Co.
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General Lighting Products Co.
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Nathan H. Eglowstein

General Outdoor Advertising Co., Inc.
515 So. Loomis St., Chicago, Ill. *C. E. Freeland*

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Electric Building, Atlanta 1, Ga.
C. M. Wallace, Jr.

Gibson Manufacturing Co.
1919 Piedmont Circle N. E., Atlanta, Ga.
R. R. Gibson

Gill Glass & Fixture Co.
Amber & Tioga Sts., Philadelphia 34, Pa.
C. A. Gill

Gillinder Brothers, Inc.
Erie & Liberty Sts., Port Jervis, N. Y.
J. Fletcher Gillinder

Globe Lighting Products Co., Inc.
1710 Flushing Ave.,Brooklyn 6, N. Y.
Isidor Rosenblatt

Graybar Electric Co., Inc.
420 Lexington Ave., New York 17, N. Y.
Raymond C. Kinney

Guardian Light Company Inc.
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Fred E. Guth

The Hankins Container Co.
5044 W. 106th St., Cleveland 11, Ohio
Ray T. White

Hartford Electric Light Co.
266 Pearl St., Hartford 3, Conn. *Victor Ouellette*

Hawkins Electric Co.
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Cleveland 13, Ohio *Emil J. Mandalifino*

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James H. Diffenwierth

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H. L. Logan

Holophane Company, Limited
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Jack R. Stone

Hub Electric Company
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I. M. Fixman

Hubbard and Company
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Iowa-Illinois Gas & Electric Co.
United Light Bldg., Davenport, Iowa
John M. Hollingsworth

Iowa Power and Light Co.
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N. Bernard Gussett

Iowa Public Service Co., East Div.
400 Commercial St., Waterloo, Iowa
C. R. Wagoner

Iowa Public Service Co., Sioux City Division
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Jefferson Electric Co.
Bellwood, Ill. *L. Maurer*

Jersey Central Power & Light Co.
501 Grand Ave., Asbury Park, N. J. *D. L. Douglas*

Jewel Electric Products, Inc.
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Bloomfield, N. J. *Joseph G. Wares*

Joleco Corporation
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Jones Metal Products Co.
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Joslyn Mfg. & Supply Co.
3700 So. Morgan St., Chicago 9, Ill. *J. H. Fahey*

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Kansas Gas & Electric Co.
P.O. Box 208, Wichita, Kans. *H. W. Hobson*

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Ivan Kirlin

Kopp Glass, Inc.
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Morris Kurtzon, Inc.
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Richard C. Piper, Jr.

The Leeds & Northrup Co.
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Dr. R. C. Machler

Light Control Company
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Stanley E. Lindahl

Lighting Products, Inc.
2259 W. Park Ave., Highland Park, Ill.
D. E. Dunne

Lightolier Co.
11 East 36th St., New York 16, N. Y. *H. Stollnitz*

(Continued on page 24A)

(Continued from page 23A)

Line Material Co., Division of McGraw Electric Co.
800 North 8th St., Milwaukee 1, Wis. *M. C. Harsh*

Litecontrol Corp.
36 Pleasant St.
Watertown 72, Mass. *Lawrence E. Brown*

Litecraft Manufacturing Corp.
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Lithonia Lighting Products Co., Inc.
Lithonia, Ga. *Robert J. Freeman*

Louisiana Power & Light Co.
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New Orleans, La. *C. L. Osterberger*

Luminator, Inc.
120 N. Peoria St., Chicago 7, Ill.
Albert L. Arenberg

Luminous Ceilings Inc.
2500 West North Ave., Chicago 47, Ill.
Louis Rosenstein

Luxor Lighting Products Inc.
Empire State Building
New York, N. Y. *Sergei Markstan*

Lynn Gas & Electric Co.
90 Exchange St., Lynn, Mass. *James A. Cook*

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P.O. Box 950, Newburgh, N. Y. *Norman Macbeth*

Main Electric Company
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William Kamin

Major Equipment Company Inc.
4609-19 Fullerton Ave.,Chicago, Ill.
Ross O. Major

Markel Electric Products, Inc.
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Morris L. Markel

Markstone Manufacturing Co.
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Marvin Manufacturing Co.
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Chicago 44, Ill. *Henry E. Burkhardt*

Metalcraft Products Co., Inc.
Mascher & Lippincott Sts.
Philadelphia 33, Pa. *Nathan Bloom*

Metropolitan Edison Co.
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T. O. McQuiston

Metropolitan Electrical Supply Co.
20 N. Jefferson St., Chicago 6, Ill. *Fred Pedrigi*

Midwest Chandelier Co.
15th & Gentry Sts., No. Kansas City 16, Mo.
Sidney Lefkovitz

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St. Louis 7, Mo. *C. J. Youngblood*

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Gulfport, Miss. *R. M. Shearer*

Mississippi Power & Light Co.
Lampton Building, Jackson, Miss. *B. M. Davis*

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Bernard Mitchell

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Maplewood 17, Mo. *Edwin L. Ehret*

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W. L. Hayes

The Montana Power Co.
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236 Lyon St., Albany, Ore. *A. T. Peterson*

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Pasadena 1, Calif. *T. M. Goodrich*

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Luminall Paint Div.
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535 Vine St., Johnstown, Pa. *Howard E. Ross*

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P. G. Dingledy

Pennsylvania Power & Light Co.
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Joseph L. Jaffe, Jr.

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Public Service Co. of Indiana, Inc.
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(Continued on page 27A)

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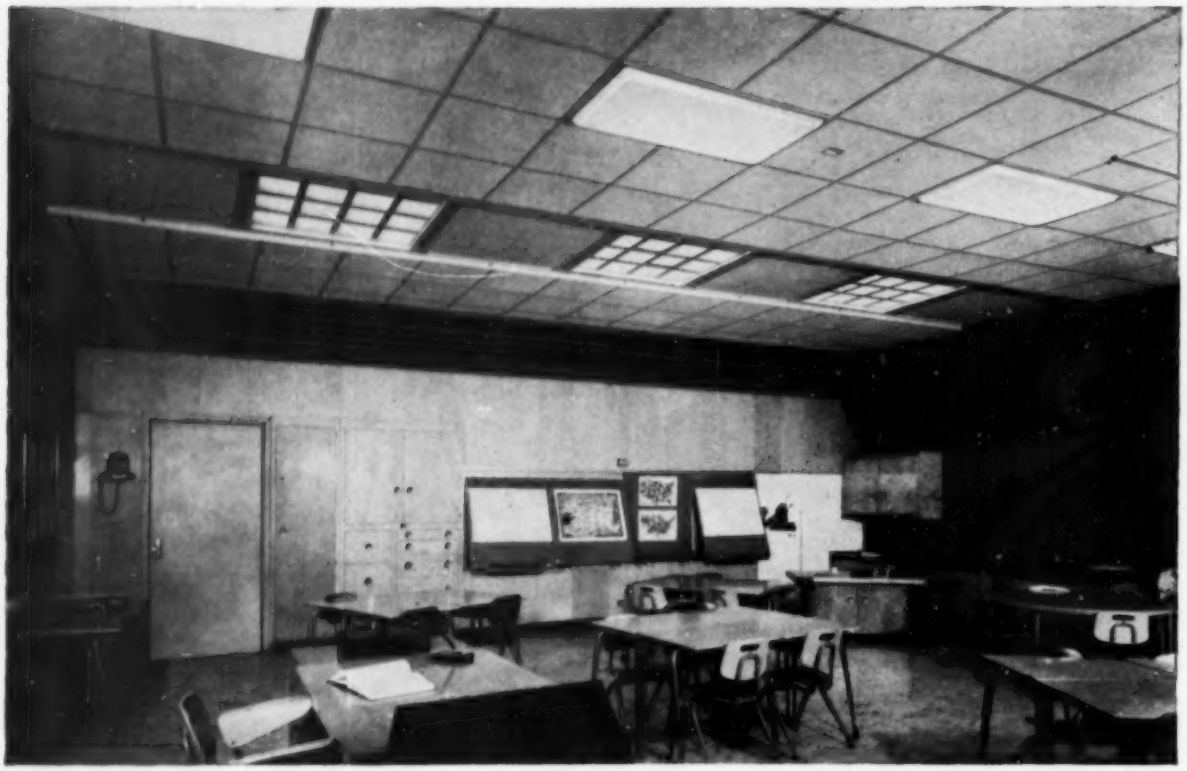
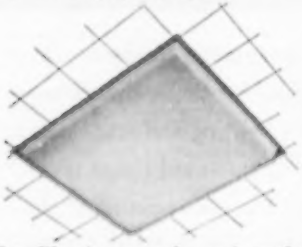
Wakefield Beta-Plex Luminaires Ideal for Lower Classroom Ceilings



Note that Wakefield Beta-Plex units were chosen for the low ceilinged Research Laboratory Classroom at the University of Michigan.



Beta-Plex is a complete unit ready for recess mounting in a suspended ceiling. Ballasts and lampholders are contained in a metal housing. A Touch-Latch releases and closes the Rigid-Arch Plexiglas diffuser, making the interior of a Beta-Plex unit readily accessible. Four sizes: 2' x 2', 2' x 4', 1' x 4' and 4' x 4'.

Need for recessed unit met by Beta-Plex; diffuser extends only 1½" below ceiling line

Conventional suspended fixtures cannot be used on the new 8 to 10 foot ceilings. Required is a luminaire like the Wakefield Beta-Plex, which mounts practically flush with the ceiling. Beta-Plex has a Plexiglas diffuser which distributes light evenly, without direct glare. And when unlit, because it has a special non-specular mat finish, the diffuser does not reflect an image of the brightly daylighted window.

School officials and architects planning schools with low classroom ceilings are invited to send for an illustrated folder on the Wakefield Beta-Plex luminaire. The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada: Wakefield Lighting Limited, London, Ontario.

Wakefield Over-ALL Lighting

(Continued from page 24A)

Ruby Lighting Corp.
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Ruby-Philite Corp.
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Louis Phillips

Rumsey Electric Co.
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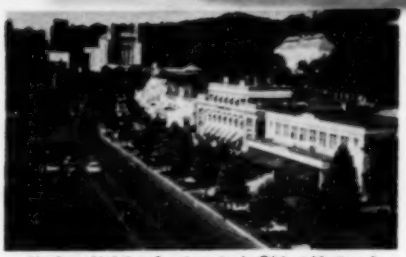

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COMPARE...

Exclusive on the Ortho-77 is the Uni-Race channel for automatic alignment, the Plug-in Socket for safe handling without disconnecting the circuit and unheard of flexibility, and the rugged V channel with integrated construction for permanence of shape.

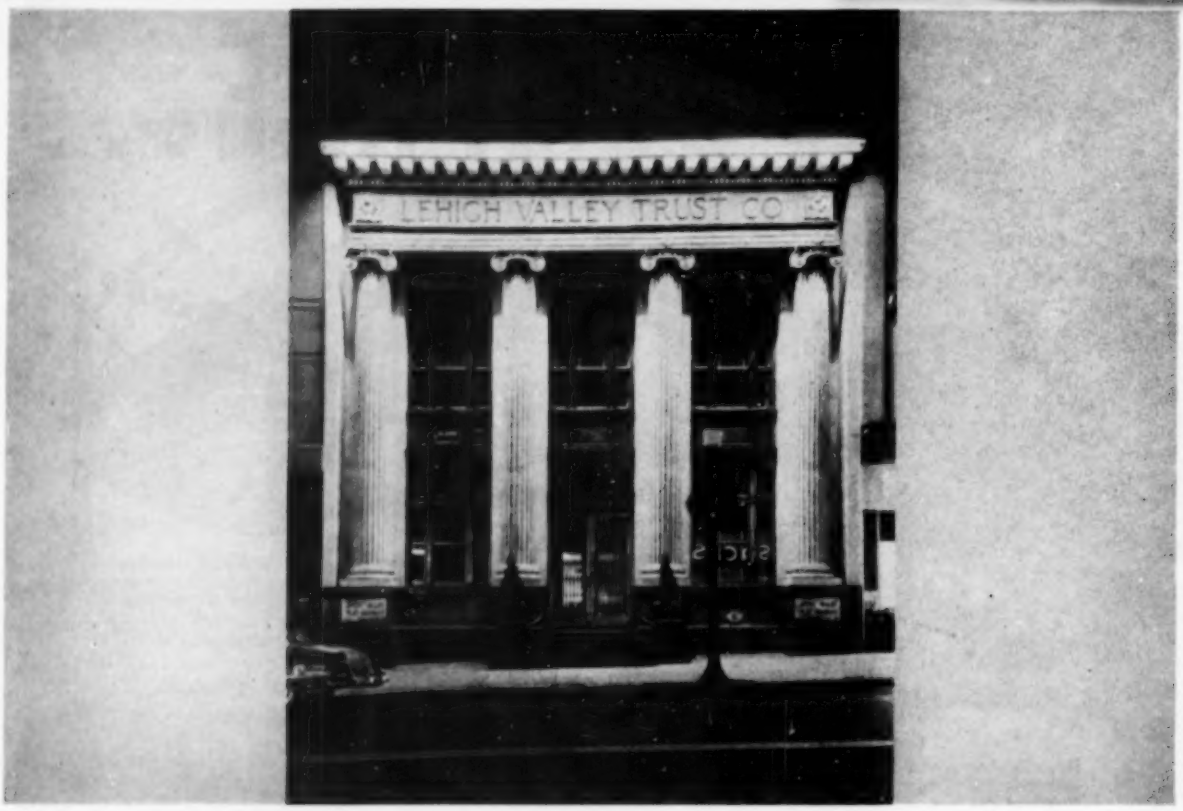
	Ortho-77	Conventional
OVERALL COST	Reports show savings up to 50% in installation costs with the Ortho-77, which means that you can buy the Ortho-77 *installed* for the same price as ordinary fluorescent fixtures.	Installation costs of ordinary fluorescent fixtures average nearly *twice* that of comparable Ortho-77 installations. Although initial costs are in some instances lower, the overall installed cost of the Ortho-77 is favorable.
INSTALLATION	Uni-race sections can precede fixtures to the job. Easily and quickly mounted, they assure positive, permanent straight alignment automatically. Fixtures may be shipped when the building is ready for occupancy and can be hung without tools in minimum time.	In conventional installations, heavy fixtures often must be handled many times on the job. Permanent alignment is frequently difficult to maintain without accessories. Because of the tools and handling necessary, it is difficult to keep fixtures clean in mounting.
FLEXIBILITY	Fixtures of same wattages are interchangeable on the same Uni-Race. Lighting levels can be raised from two to four lite in a matter of minutes, or fixtures can be mounted at spaced intervals and made continuous anytime later without tools in a minimum of time.	Conventional fixtures offer virtually no flexibility in so far as fixture interchange or change of lighting layout is concerned.
MAINTENANCE	Ballast replacement can be made in a matter of minutes by changing fixtures instead of parts. Repairs can be made in the shop at will and service on the line will not be interrupted *even while changing fixtures.*	With conventional fixtures, it is necessary to suspend service on the entire circuit to make repairs. Frequently the working area is disrupted for several hours while this is being accomplished.

WRITE TODAY for descriptive folder giving details of the Ortho-77

GIBSON Manufacturing Co.

1919 PIEDMONT CIRCLE, N. E.

ATLANTA, GEORGIA



LEHIGH VALLEY TRUST COMPANY, ALLENTOWN, PA.
Continuous cornice units with specular Alzak reflectors for utilizing 72" 1000 m.a. T-12 "outdoor" fluorescent lamps furnish the illumination for this 35-foot high facade. Units designed and manufactured by Rambusch.

A New Era in Exterior Lighting!

Whenever new lighting "tools" are available, you can be sure Rambusch will put them to use.

With the advent of trouble-free, long life, efficient fluorescent lamps, a rebirth of exterior and facade floodlighting is rapidly taking place. Rambusch "Sidewalk Lighting" and architectural facade lighting are seen in many States. But—make no mistake about it—such lighting must be truly "architectural-engineered" or a beautiful facade can be marred over night! All lighting applications, whether exterior or interior, receive individual, careful design consideration by our staff of engineers and designers working with our field representatives.

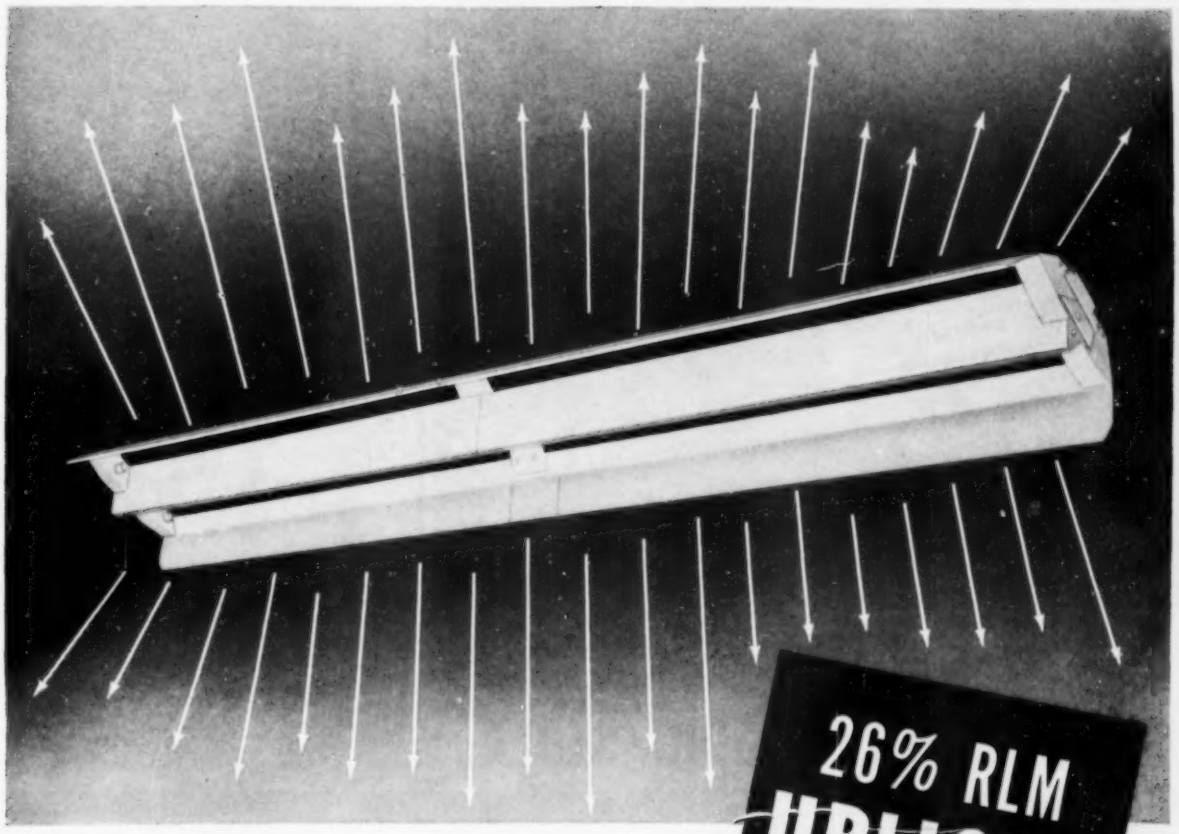
There are 50 Rambusch field representatives, and one of them is near you. Recommendations for personalized lighting treatment is yours for the asking.

Address your inquiry to

DESIGNERS • MANUFACTURERS

RAMBUSCH 40 WEST 13th STREET, NEW YORK 11, N. Y.

New Perspective on Industrial Lighting



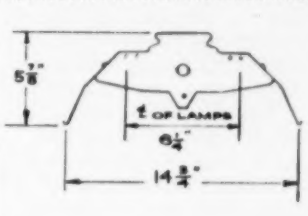
New Electro Silv-A-King

Electro Silv-A-King now brings you this 26% RLM approved Uplight fixture, with these outstanding features . . .

- Cast Aluminum Ends
- Continuous Run Mounting Without Costly and Time-Consuming Couplers
- All Units May Be Used for Individual or Continuous Mounting
- Reflector Locking Method for Low Cost Installation
- 89% Efficiency—With 32% Side Shielding
- Available with Louvers for Longitudinal Shielding

This new Electro Silv-A-King Uplight fixture brings industrial ceilings out of the shadow and thus improves over-all seeing conditions—and plant appearance. Actual tests have proven this new open-top reflector keeps lamps and reflecting surfaces cleaner longer—thus maintaining a higher lighting level over longer period of time—an important economy.

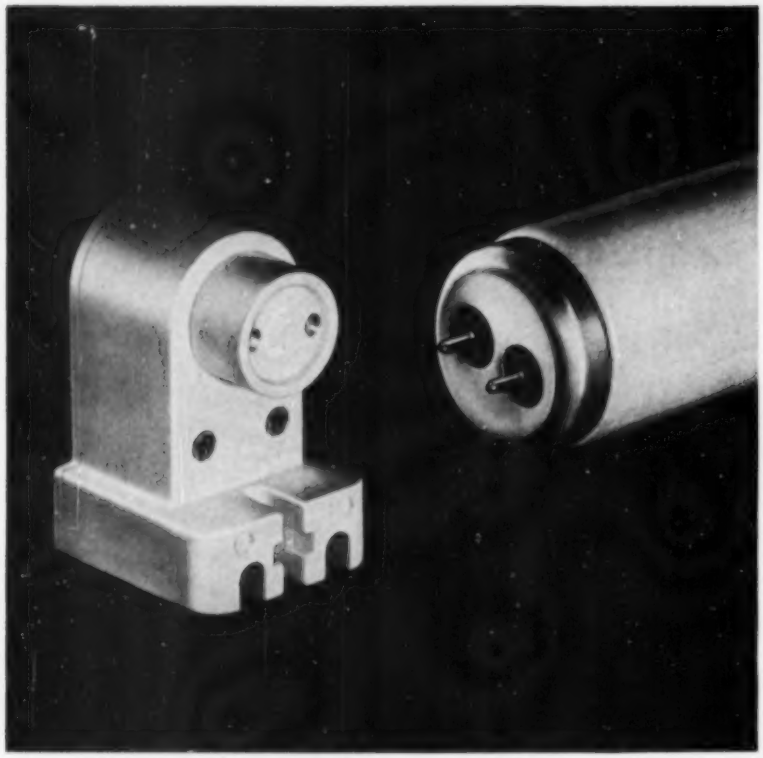
Available in lifetime porcelain or baked enamel finish.
Fluorescent and Rapid Start: 2 Lamp 4-ft. 40 Watt
4 Lamp (in tandem) 8-ft. 40 Watt
Slimline: 2 Lamp 4-ft. 2 Lamp 6-ft. 2 Lamp 8-ft.



SEND FOR COMPLETE CATALOG

Electro Silv-A-King Corporation

1535 SOUTH PAULINA ST., CHICAGO 8, ILL. • FAIRFIELD AND STATE STS., BRIDGEPORT 5, CONN.



G-E Offers New Heavy-duty Rapid-start Lampholder Set

Built-in Telescopic Action Makes Insertion Easy Eliminates the Hazard of Falling Lamps

General Electric's Accessory Equipment Department offers a new heavy-duty bi-pin lampholder set designed to meet the growing demand for sturdy, easy-to-install lampholders. The lampholder set can be used for either rapid-start or switch-start lamps. It provides telescopic action and gives support for the full length of the lamp pins.

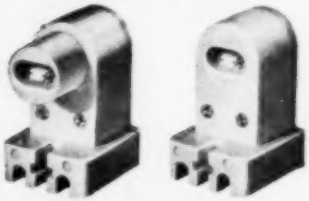
The new lampholders have spring-loaded contacts and the advantage of simple push-in lamp insertion. This design assures positive contact at all times and holds the lamp securely in place without need of special guards. The lampholders are listed by Underwriters' Laboratories, Inc., for use with all T-8 and T-12 bi-pin lamps. Outline dimensions are the same as General Electric's popular 502X63 and 502X64 slimline lampholders.

For complete information on these and other General Electric lampholders, write to Section Q71-987, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product

GENERAL ELECTRIC

OTHER G-E RAPID-START LAMPHOLDERS



Rapid-start telescopic type: for use with new G-E 96T12 high-output lamps. Interchangeable in mounting with slimline telescopic types . . . has the same outline dimensions as the new telescopic bi-pin lampholder set.

Medium bi-pin disconnect type: contains circuit-interrupting switch and 9-inch pigtail lead. For use with single T-12 rapid-start lamps.

Standard medium bi-pin type: may be used for rapid-start application with T-8 and T-12 lamps. Rotary-lock lamp insertion.

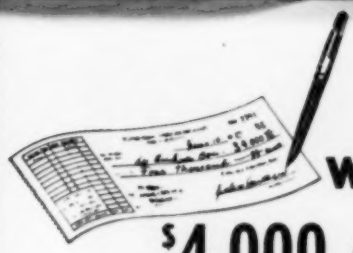
Rapid-start Turret* lampholder: spring-backed contact plates anchor lamps securely and eliminate safety guards. Available in two-lamp types on 3½" and 5" centers and in three-lamp type on 2½" centers. Built-in shunts eliminate splices.

*Registered Trade-mark General Electric Company

ACCESSORY EQUIPMENT DEPARTMENT

Manufacturers of wiring components for lighting • appliances and equipment power supply cords • wiring harnesses

A department of General Electric's Construction Materials Division, Bridgeport, Connecticut



would you turn down a savings of $4,000 on a $40,000 lighting expenditure?

You can enjoy the benefits of the *finest* lighting money can buy and effect really substantial savings at the same time, simply by buying the *right* lighting fixture. Time and again, the better design and efficiency of Smithcraft Fluorescent Fixtures result in *fewer units* to produce recommended lighting levels.

Here's an actual case history of how a Pennsylvania department store saved 10% in initial costs and 10% in operating costs . . . or approximately $4000 on a ten-year $40,000 expenditure.

Before re-lighting, a complete survey was made and exact lighting requirements were established. To meet these requirements, Smithcraft units and units of several nationally-known top quality manufacturers were subjected to an exhaustive *comparative* analysis. Here are the results:

10% *FEWER UNITS REQUIRED*

Number of units required to achieve recommended lighting levels: ..... Smithcraft — **270**
2nd Best Fixture — 297
3rd Best Fixture — 339

10% *LESS INSTALLATION COST*

Proportionately less labor and materials were required to install the 270 Smithcraft units than the 297 units of the nearest competitor.

10% *FEWER LAMPS*
(Initial & Replacement)

Lamps required: ..... Smithcraft — **706**
2nd Best Fixture — 776
3rd Best Fixture — 914

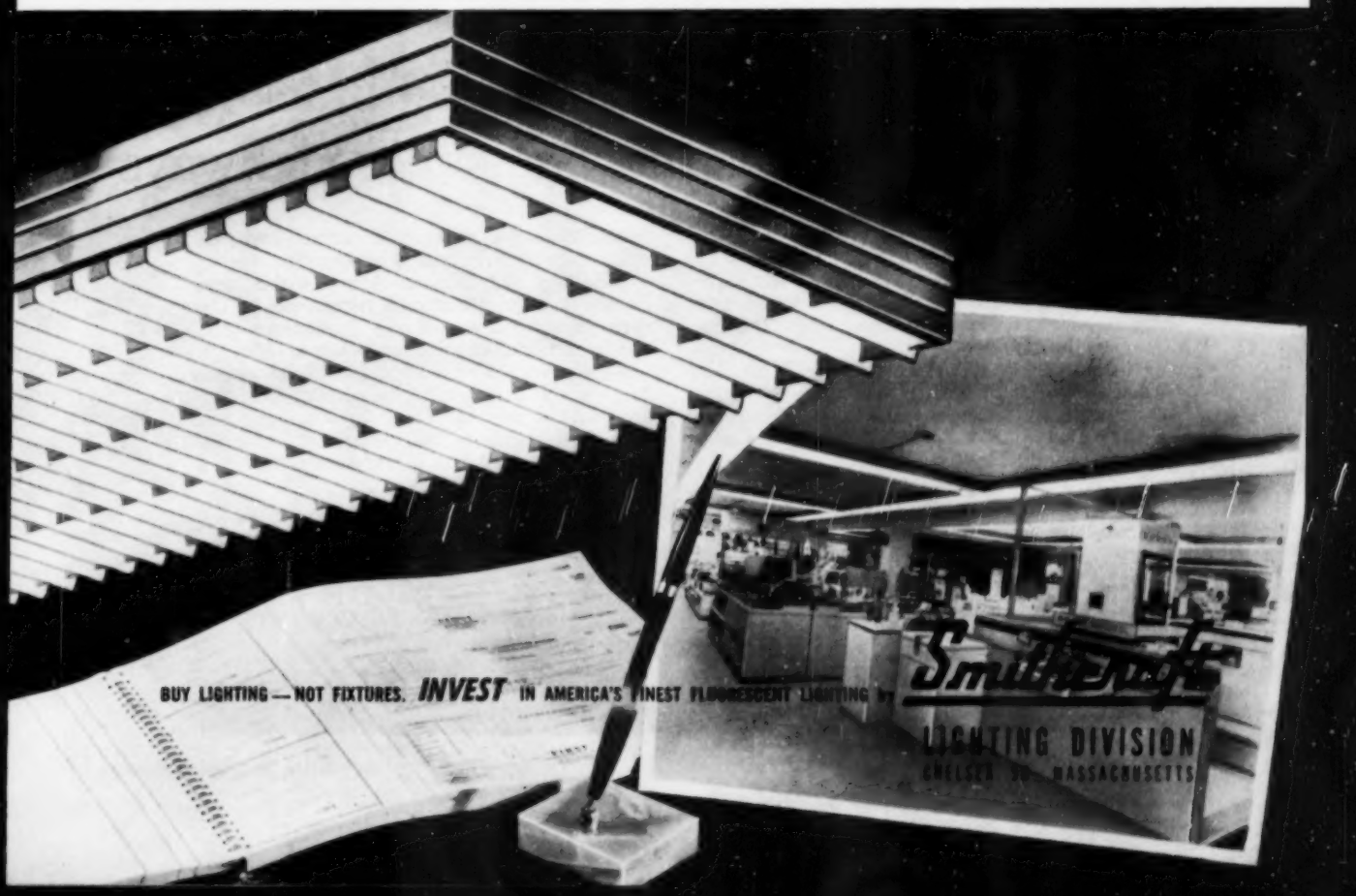
Recommended practice is to replace lamps every 18 months—a continuing 10% savings.

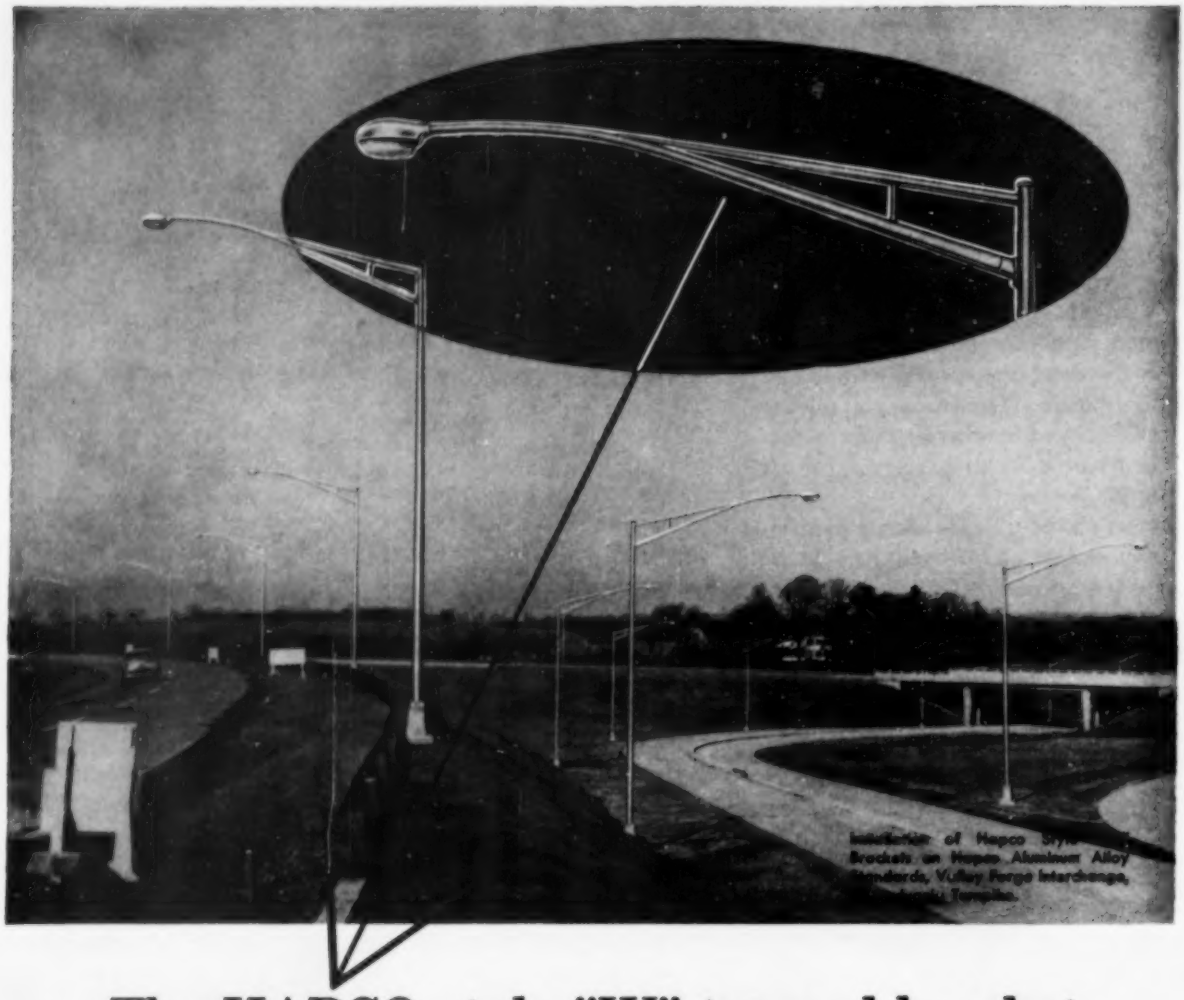
10% *LESS POWER CONSUMPTION*

Required wattage:..... Smithcraft: **51.3** kilowatts
2nd Best Fixture: 56.3 kilowatts
3rd Best Fixture: 64.8 kilowatts

Whether you're lighting a store, office, school, factory, or institution, it pays to *buy lighting — not fixtures.* Invest in Smithcraft — America's Finest Fluorescent Lighting Equipment.

PHOTOGRAPH SHOWS AN INTERESTING PATTERN ARRANGEMENT OF THE SMITHCRAFT LOUVERLITE SLIMLINE IN THE PENNA. DEPT. STORE DESCRIBED ABOVE.


BUY LIGHTING — NOT FIXTURES. INVEST IN AMERICA'S FINEST FLUORESCENT LIGHTING BY
Smithcraft
LIGHTING DIVISION
CHELSEA 50 MASSACHUSETTS



Installation of Hapco Style "W" Brackets on Hapco Aluminum Alloy Standards, Valley Forge Interchange, Pennsylvania Turnpike.

The HAPCO style "W" trussed bracket for illuminating modern, wide super-highways

The reserve strength built into the HAPCO Style "W" Bracket has made it a favorite for turnpikes and other heavy traffic highways, where high mounting heights and extended luminaires are required. The installation shown is at the Valley Forge Interchange of the Pennsylvania Turnpike. A Style "W" 15-foot bracket, illustrated, is mounted on a 30-foot HAPCO Aluminum Alloy Pole. These Style "W" brackets, also available in 10 and 12-foot lengths, are interchangeable with each other and the same mounting height is attained.

HAPCO Aluminum Alloy Poles and Brackets offer maximum resistance to the most severe atmospheric conditions and never require painting or other treatment. They are furnished with a mat finish which is protected in shipment by a heavy weather-resistant wrapping. Their light weight and easy erection make their installed cost comparable with poles of other materials.

HUBBARD ALUMINUM PRODUCTS COMPANY

MANUFACTURERS OF HAPCO QUALITY ALUMINUM PRODUCTS

A Division of HUBBARD and COMPANY

6301 Butler Street • Pittsburgh 1, Pa.

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Years ahead in design....

PARGLO* LOUVERS

ANOTHER *Eastern* EXCLUSIVE

TO GIVE RECESSED LIGHTING

- UNBELIEVABLE NEW BEAUTY
- DISTINCTIVE DESIGN
- TRUE LIGHTING EFFICIENCY

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EASTERN FIXTURE CO.

170 VERNON STREET, BOSTON 20, MASSACHUSETTS

GARCY Starliner
Two-lamp and four-lamp units in 4 ft. and 8 ft. lengths for standard or slimline lamps.
I LIKE ITS LOOKS
I LIKE ITS EFFICIENCY
I LIKE ITS EASY MAINTENANCE
I LIKE ITS EASY INSTALLATION
I LIKE ITS LONG LIFE

it's GARCY for "I" appeal

Garcy, by design, looks out for everyone's interests...wins the approval of all who have a voice in specifying, installing, maintaining and *paying* for lighting fixtures.

Consider the Garcy Starliner. Slim, trim and functional, this fixture has captured the fancy of architects and designers. It can be surface mounted to create the impression of built-in lighting...at a fraction of the cost. That's good for the man who pays the bill. He'll also like its long-life construction details...protective metal rails for the Alba-lite glass side panels, Garlite enamel that stands up like the finish on your car, louver cross-fins that are held under spring tension to prevent looseness, rattle or "sing."

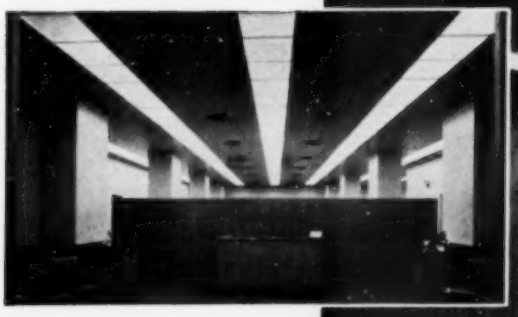
Ask any mechanic who has worked with the Garcy Adjustable Stem Hanger. He'll tell you what a time-saver it is...especially where there are ceiling obstruction or slopes. Ask any maintenance man about the convenience of re-lamping two Starliner fixtures from a single ladder position. For all concerned, Garcy means "Quality...*by design*." Send for complete data sheets.

GARCY Quality *by Design*

GARDEN CITY PLATING & MFG. CO.

1760 N. Ashland Ave., Chicago 22, Ill. ***In Canada:*** **Garcy of Canada, Ltd., 191 Niagara St., Toronto**

Architects—Holabird & Root & Burgee
Lighting Fixtures—Morris Kurtzon, Inc.
Electrical Contractors—Kelso-Burnett Electric Co., Inc.
Lightingware—Corning Fota-Lite



Visitors are greeted in a pleasant, well-lighted reception area. Workers in the area beyond the smart panel find that Fota-Lite illumination is glare and shadow free.

A perimeter of Fota-Lite brightens this executive office, while a concentrated area over the desk provides excellent illumination for reading and writing. Fota-Lite is perfect for luxury lighting.

How modern offices can use Corning Fota-Lite to advantage

The rich setting of these new offices of a large oil company show how CORNING Fota-Lite is used best. Notice how evenly it distributes light.

Fota-Lite is richly rewarding to work with. It gives you all of the lighting advantages of louvered lighting *plus* the advantages of flat glass—easy cleaning.

Fota-Lite provides high levels of illumination with low brightness. The soft opal louvers afford diffusion at normal viewing angles. Vertical light, however, is unrestricted.

Fota-Lite is not color selective. You can use it freely for wonderful effects where colors form a mood or where color encourages a buying decision.

What is Fota-Lite?

It's fine crystal glass in which tiny opal louvers are created by a photographic process. Strong, lightweight, free of warpage, Fota-Lite encloses light sources with a minimum of bulk. You can use it for an entire luminous ceiling or for keying interest to relatively small areas. Fota-Lite offers rare value when it comes to beautiful lighting and lighting that is efficient. And the smooth glass surface permits easier cleaning.

You can get complete information about Fota-Lite and other Corning products just by signing and mailing the request slip below. We'll send you a free copy of Architects and Engineering Handbook of Lighting Glassware.

CORNING GLASS WORKS
CORNING, N. Y.

Corning means research in Glass

CORNING GLASS WORKS, Dept. IE-9, Corning, N. Y.

Please send me a copy of the "Architects and Engineers Handbook of Lighting Glassware."

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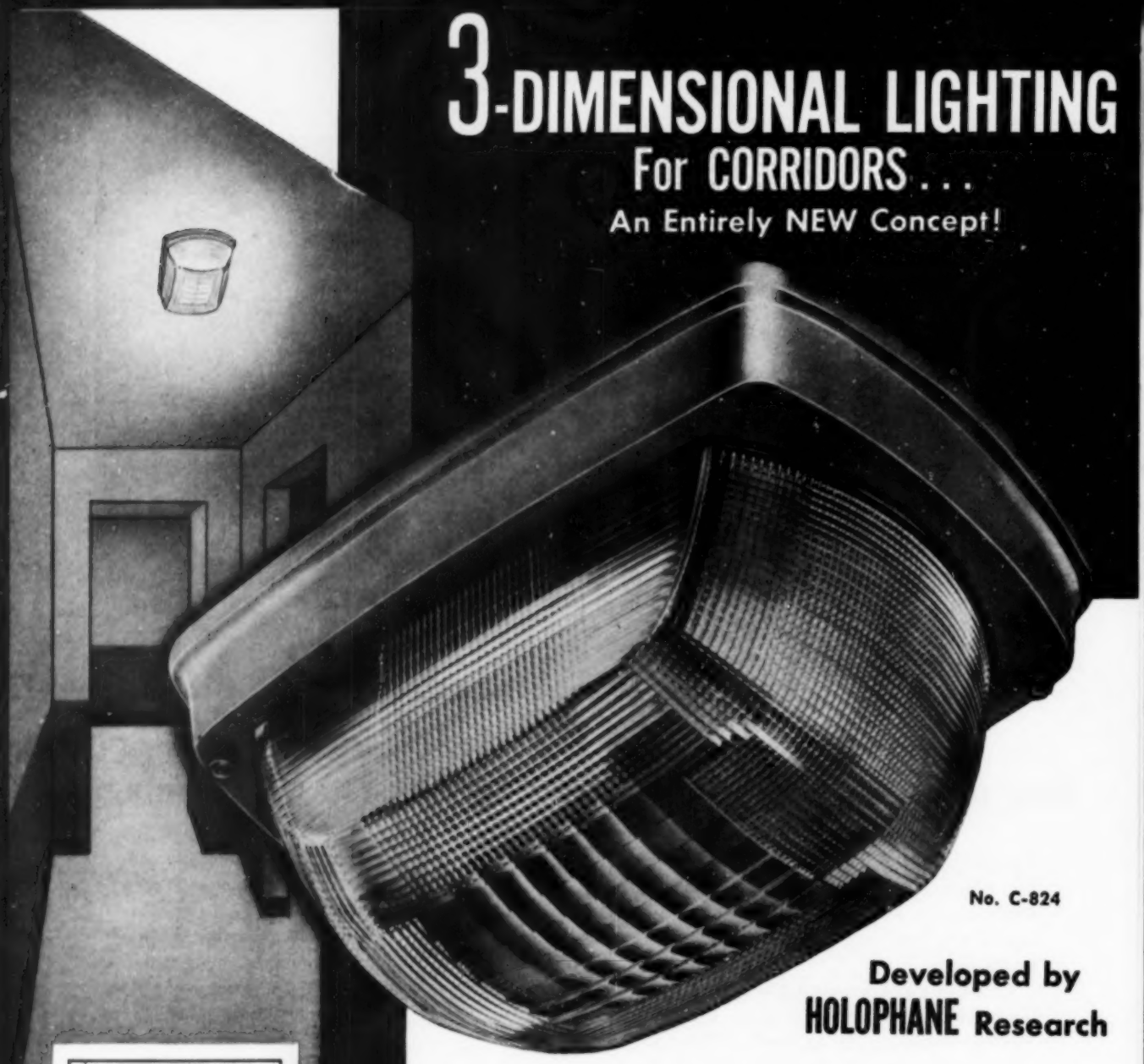
3-DIMENSIONAL LIGHTING
For CORRIDORS . . .
An Entirely NEW Concept!



No. C-824

Developed by HOLOPHANE Research

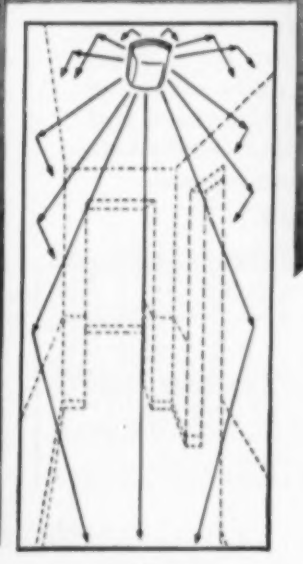


Diagram of Control Features

More than just another unit — this new Holophane Luminaire introduces an altogether new approach to corridor lighting. It outmodes the old *wasteful* methods that spread glaring light over passageway floors. Its "three-dimensional" control sends *useful* light in all directions—up to the ceiling and across to the walls, as well as down to the floor. Reflections from these surfaces result in balanced illumination with high visibility. The redirection of light, avoiding the glare area, provides an atmosphere of complete comfort and safety for those in the corridor. With all its advantages in efficiency and low brightness, No. C-824 assures definite economies in installation and maintenance costs . . .

Architects, engineers and contractors are invited to write for complete data, without obligation.

Holophane

HOLOPHANE COMPANY, Inc.

Lighting Authorities Since 1898 · 342 MADISON AVENUE, NEW YORK 17, N.Y.

THE HOLOPHANE COMPANY, LTD., THE QUEENSWAY, TORONTO 14, ONTARIO

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GENERAL CONTRACTORS

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FORD

NEW PLANT AT CLAYCOMO, MO.

Fixtures by
Electro Silv-A-King Corp., Chicago, Ill.

Advance Fluorescent Lamp Ballasts Used Throughout

8,424 two-lamp slimline fluorescent fixtures were used in this modern aircraft wing plant. ADVANCE BALLASTS were purchased for use in this installation. You too can depend on ADVANCE "Certified" ballasts for longer life and more efficient operation. Time-tested for your assurance.

Designed & Engineered
BY THE
WORLD'S LARGEST MANUFACTURER
DEVOTED *Exclusively* TO THE PRODUCTION OF
FLUORESCENT LAMP BALLASTS

PLANS AND SPECIFICATIONS:

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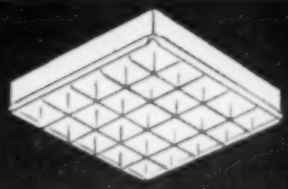
2950 N. WESTERN AVENUE, CHICAGO 18, ILLINOIS, U.S.A.

Only - Luve·tile



When it comes to Low brightness, large area light sources . . .

because . . .

LUVE-TILE in the long run is the most economical illuminated ceiling you can buy.

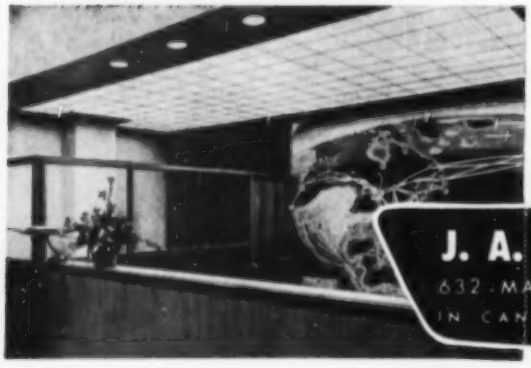
LUVE-TILE is easy to maintain—dirt collection is much less rapid than with other types . . . and it will not hold insects and other small matter.

LUVE-TILE is hinged, servicing of fixtures is easy. Rigid to handle, and light in weight, it is simple to remove and wash.

LUVE-TILE may be assembled to suit any room and custom-made work is never necessary. No unsightly horizontal bars or rosettes are used for support.

LUVE-TILE comes in 4 shades making possible unlimited colour combinations. Sprinklers and air ducts are concealed and wiring and other work may be simply surface mounted. Also low cost acoustic material may be sprayed on the cavity above the tile for sound proofing.

LUVE-TILE is practical and economical to use in any area, right down to a few square feet. It is also widely used in display for special effects.



J. A. WILSON LIGHTING & DISPLAY LTD.

632 MAIN STREET, BUFFALO 2, N.Y. PHONE MOhawk 5596

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now...

for the first time...

A PRACTICAL

outdoor fluorescent

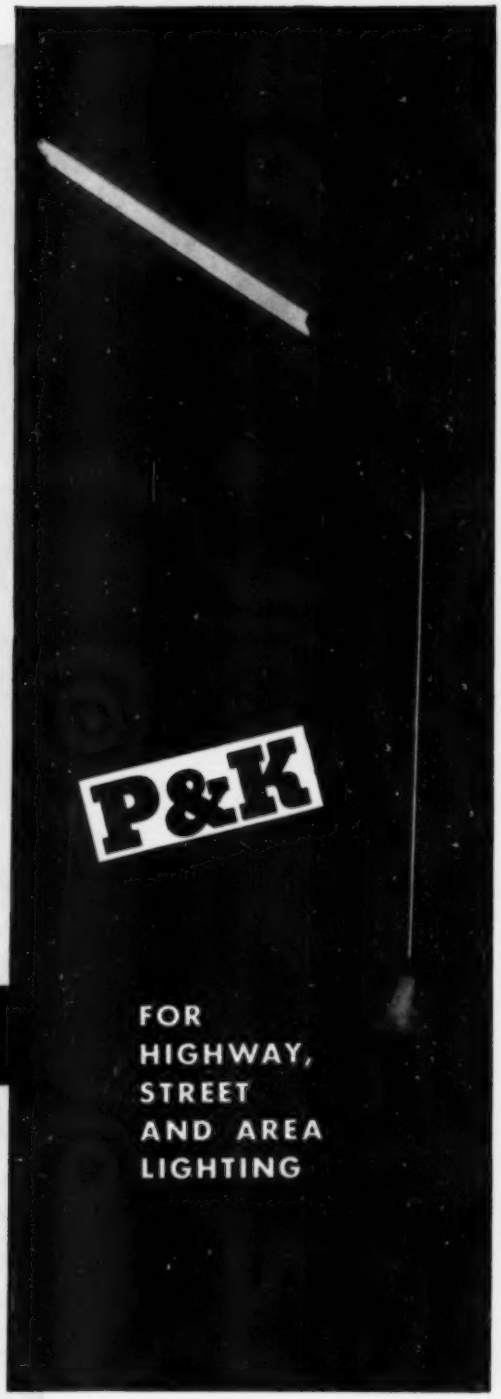
LUMINAIRE & STANDARD

Again, P & K leads the way with a great new development introducing a new era in highway, street, and area lighting. With these new P & K engineered fluorescent luminaires, *available as a complete package with companion-designed P & K Aluminum Standards*, any outdoor lighting facility can achieve new highs in performance, versatility and appearance... at new all-time lows in cost!

HOW YOUR LIGHTING CAN BENEFIT WITH **P & K** FLUORESCENT LUMINAIRES

- **HIGHEST LIGHT LEVELS WITHOUT GLARE OR PHYSICAL BULK**
- **ADJUSTABLE LIGHT DISTRIBUTION FOR ON-THE-SPOT REQUIREMENTS**
- **LOW COSTS, INCLUDING PURCHASE, INSTALLATION, OPERATION AND MAINTENANCE**
- **PLEASANT, GLARE-FREE LIGHT IN ANY WEATHER**
- **NORMAL COLOR DIFFERENTIATION IMPROVES VISIBILITY**
- **CLEAN, MODERN DESIGN**
- **MODELS FOR ALL LIGHTING NEEDS**
- **ADAPTABLE TO EXISTING INSTALLATIONS**

ENGINEERS AND OFFICIALS CONCERNED WITH OUTDOOR LIGHTING ARE INVITED TO WRITE FOR FULL INFORMATION.



Pfaff & Kendall

84 Foundry Street
Newark 5, New Jersey

"Personally, I like 'em built to my own specifications"

And Speaking of Light Fixtures...

Light & Power fluorescent fixtures are made in our own plant from start to finish . . . not merely assembled. That's why we're uniquely equipped to build light fixtures exactly to your own particular specifications.

For all the advantages of "custom-made" fixtures at the cost of standard ones, wire or write today for our catalog and prices. Distributed by Electrical Wholesalers Only.

LIGHT & POWER UTILITIES CORP.

1035 FIRESTONE BLVD. MEMPHIS, TENNESSEE

(*Continued from page* 19A)

somebody else had invented everything Edison got credit for and ended by issuing eight challenges to Edison, among them a challenge to maintain a vacuum in the lamps and another to run a lamp as long as three hours. He concluded "And therefore I allege that all Mr. Edison's statements are erroneous, and I offer $100 as a prize for him to prove each of the above eight allegations."

On Tuesday, the 23rd, the *New York World* entered the fray with a letter from one C. Tessie du Motay which maintained that Edison's lamp could not possibly be successful because its carbon could not last and its vacuum could not be maintained. He ended with "One must look upon Edison's new electric playthings as the experiments of a semi-practical prestidigatateur."

Mr. Sawyer returned to the press on the 24th, this time in the *World*. Here he accused Edison of stealing the light from him. "I object decidedly to his claiming my invention as his own, especially when it seems clear that the object of the announcement was to raise money. Over a year ago I experimented with the horseshoe lamp and found it a failure." He further said that "the gas men are at the bottom of the whole scheme, and mean to show, by the failure of a gentleman popularly supposed to be supernatural, that no one else can ever accomplish anything injurious to the gas interests."

By this time Edison had thrown open his labortory to all who were interested in examining his new light, and visitors began to pour into Menlo Park. On December 27th, the *Sun* printed an interview with Edison specifically refuting a letter written by Professor Henry Morton of the Stevens Institute of Technology, in which he deplored the fact the *Herald* hailed as a great success what any man of science would know to be a complete failure and thereby served to have Edison's name "discredited in the interests of any stock company or individual financiers."

Marshall Fox moved to Menlo Park and on Sunday, December 28th, the *Herald* returned to Edison's defense with more than a column describing 40 lamps burning at Menlo Park. On the 29th the *Herald* reported 53 lamps lighted. The next day it took two columns to point out that the opposition to Edison's light was comparable to the opposition to the introduction of gas lighting in 1802.

On December 31, the *Herald* ran three columns on Edison and his associates in preparation for the big public demon-

(*Continued on page* 44A)

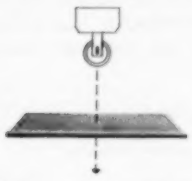
INTRODUCING

HONEYLITE*

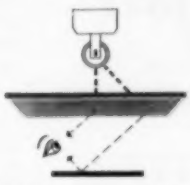
*A revolutionary new lighting-acoustical material

Startlingly simple—amazingly efficient—exceptionally beautiful—that's **Honeylite,** the new light-diffusing, acoustical, aluminum honeycomb that promises to revolutionize interior lighting construction. The most functional lighting material yet developed, **Honeylite** does **two** things: It gives the highest light transmission to surface brightness ratio available and develops, at the same time, acoustical properties inherent in the material without the use of accessory baffles.

ONLY HONEYLITE GIVES YOU THESE FOUR BIG ADVANTAGES



1 Allows 95% plus light transmission efficiency throughout lifetime of installation . . .



2 Surface brightness factor is 1/3 that of other light transmission materials . . . no reflected glare . . .

3 Noise Reduction Coefficient of .46, tested at same frequencies as acoustical ceiling materials . . .

4 Free air circulation increases lamps and ballast life up to 33-1/3%.

HONEYLITE

Design Properties

Standard Modules—
11-3/4" x 11-3/4", 23-3/4", 35-3/4" and 47-3/4". 23-3/4" x 23-3/4", 35-3/4" and 47-3/4". (1/4" cell, cut to 1/4" thickness resulting in 45 degree cut-off.)
Soft, shadow-free lighting

Clean modern design
Striking, sophisticated appearance
Can be incorporated in any ceiling design:
(a) Suspended full ceilings
(b) Recessed troffer louvers
(c) Artificial skylight effects

HONEYLITE

Physical Properties

NRC .46 acoustical rating
95% plus light transmission efficiency
Very low surface brightness
Non-combustible
Non-static material requiring no artificial destaticizer
Easy to clean . . . by vacuum suction or water rinse
No loss of air circulation with suspended ceiling

Heating and air conditioning installations simplified
Effectively screens existing overhead surface utility installations and building irregularities
Low cost lighting and acoustical results obtained
Very light weight (2 ounces per square foot)
No sag . . . retains absolutely flat surface

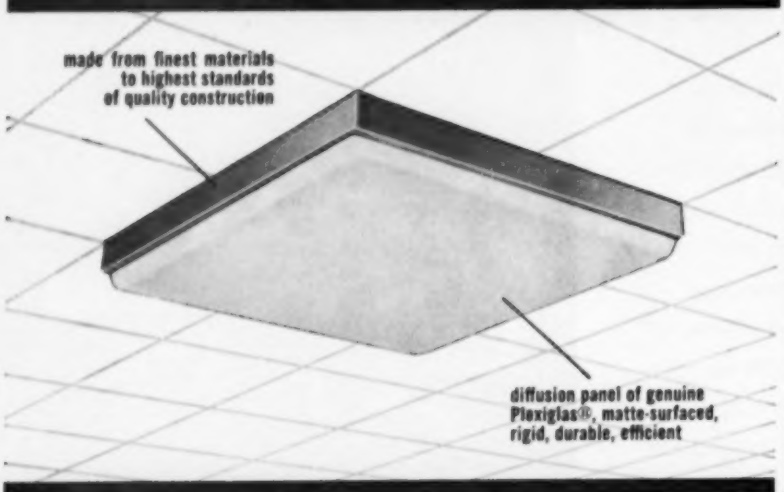
DETAILED ENGINEERING INFORMATION AVAILABLE UPON REQUEST **HONEYLITE***

* A Development of Hexcel Products Co.
955 61st Street, Oakland 8, California

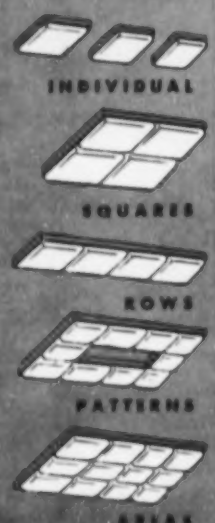
aristocrat of modern geometric luminaires

MULTI-PLEX

LOW-BRIGHTNESS DIFFUSING UNITS, SURFACE MOUNTED IN LUMINOUS AREAS OR PATTERNS


made from finest materials to highest standards of quality construction
diffusion panel of genuine Plexiglas®, matte-surfaced, rigid, durable, efficient

UNLIMITED RANGE OF DESIGNS FOR ANY CEILING



the perfect balance of visual comfort and beauty

The adaptability of MULTI-PLEX modules to any ceiling provides an ideal solution for fine lighting in terms of luminous areas. Diffusion panel is luxurious molded Plexiglas®, clean and modern, with uniform diffusion and negligible light absorption. Light output and distribution are very efficient, resulting in comfortable illumination without glare or reflections . . . and at lowest possible cost!

MULTI-PLEX is made in a complete series of models with 12", 24" and 48" modular widths, and basic lengths of 12", 24", 36", 48", 72" and 96". Mounted individually, in rows, or side by side, an amazing variety of patterns may be achieved for application to any area. Esthetically, MULTI-PLEX preserves architectural homogeneity, presents crisp contemporary lines and bold richness. Surface installation is simple, no structural changes are needed, servicing is quick and convenient. All models are also available for recessed installation, and with 45° x 45° plastic louvers.

Write for details, and for catalog showing other examples of modern LEADLITE "illumineering"

LEADLIGHT

America's fastest growing COMPLETE line of quality fluorescent fixtures

LEADLIGHT FIXTURE CO.

800-100th AVENUE OAKLAND, CALIF.

(Continued from page 42A)

stration that night. The success of that demonstration was reported by the *Herald* on January 1 and 2 and by the *Sun* on January 3.

The fact that the light worked and that thousands of people saw it work seemed to silence the critics. On January 4, a *New York Times* editorial said that Mr. Edison had been too optimistic before but that this time he may be right. That he was right is now a fact in history.

Two-Hour Jubilee Show To Climax Jubilee Celebration

Light's Diamond Jubilee will be celebrated October 24 with a two-hour television program on what is claimed as the biggest network ever put together for a single television program.

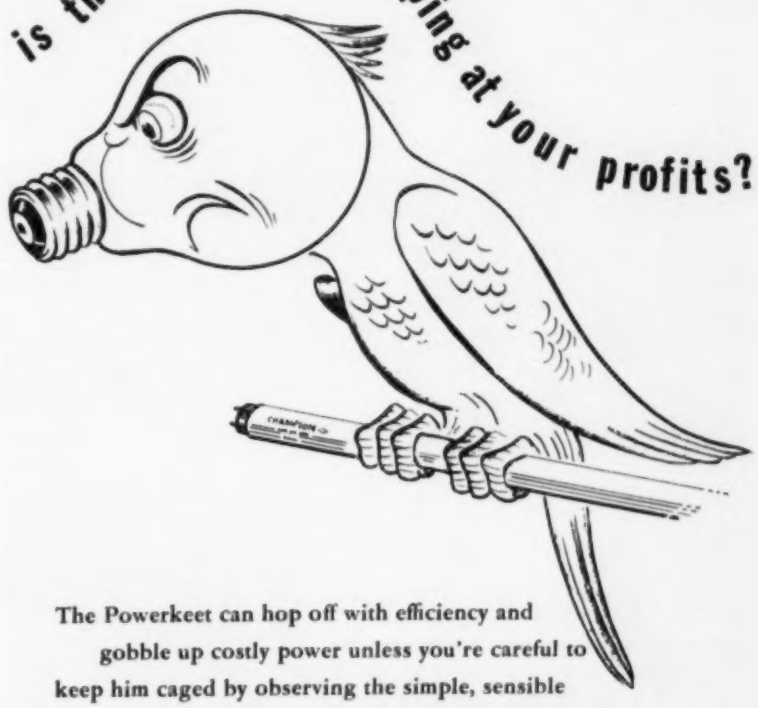
Four networks with a total of 310 stations across the country will carry the celebration. In the Eastern, Central and Mountain zones, the time will be from 9 to 11 p.m. Eastern Standard Time, and on the Pacific Coast, the program will be shown from 9 to 11 p.m. Pacific Time by kinescope.

The following list of the stations which will carry the show has been compiled by the Light's Diamond Jubilee Committee. Stations marked with an asterisk will probably televise the celebration, but according to the Committee's report have not made final arrangements.

ALABAMA	
Birmingham	WABT, *WBRC-TV
Mobile	WALA-TV
Montgomery	WCOV-TV
ARIZONA	
Mesa, Phoenix	KTYL-TV, KPHO-TV
Phoenix	KTYL-TV, KPHO-TV, KOOL-TV
Tucson	KVOA-TV, *KOPO-TV
ARKANSAS	
Little Rock	KARK-TV
Pine Bluff	KATV
CALIFORNIA	
Bakersfield	KERO-TV, KBAK-TV
Chico	KHSL-TV
Fresno, Tulare	KMJ-TV, *KJEO-TV, KVVG, KBID-TV
Los Angeles	KNBH, KNXT, KABC-TV KHJ-TV
Monterey, Salinas	KSBW/KMBY-TV
San Diego	KFMD-TV, KFMB-TV
San Francisco	KRON-TV, KPIX, KGO-TV
Santa Barbara	KEY-T
Stockton	*KTVU
COLORADO	
Colorado Springs	KRDO-TV, KKTV
Denver	KOA-TV, KLZ-TV, KBTV KFEL-TV
Pueblo	KCSJ-TV
CONNECTICUT	
Bridgeport	WICC-TV
Hartford, New Britain	WKNB-TV
New Haven	WNHC-TV
Waterbury	WATR-TV

DELAWARE	
Wilmington	WDEL-TV
DISTRICT OF COLUMBIA	
Washington	WNBW, WTOP-TV, WMAL-TV, WTTG
FLORIDA	
Ft. Lauderdale	WFTL-TV, WITV
Jacksonville	WJHP-TV, WMBR-TV
Miami	WTVJ
Orlando	WDBO-TV
Panama City	WJDM-TV
Pensacola	WPFA-TV, WEAR-TV
St. Petersburg	*WSUN-TV
W. Palm Beach	WJNO-TV, WIRK-TV
GEORGIA	
Atlanta	WSB-TV, WAGA-TV, WLW-A
Augusta	*WJBF-TV, WRDW-TV
Columbus	WDAK-TV, WRBL-TV
Macon	WNEX-TV, WMAZ-TV
Savannah	WTOC-TV
ILLINOIS	
Champaign	WCIA
Chicago	WNBQ, WBBM-TV, WBKB, WGN-TV
Danville	WDAN-TV
Decatur	WTVP
Peoria	WEEK-TV, WTVH-TV
Quincy	WGEM-TV, KHQA-TV
Rockford	WTVO, WREX-TV
Rock Island	WHBF-TV
Springfield	WICS
INDIANA	
Bloomington	WTTV
Elkhart	WSJV-TV
Evansville	(see Henderson, Ky.)
Fort Wayne	WKJG-TV
Indianapolis	WISH-TV, WFBM-TV
Muncie	WLBC-TV
South Bend	WSBT-TV
Terre Haute	WTHI-TV
IOWA	
Ames	WOI-TV
Davenport	WOC-TV
Des Moines	*WHO-TV, KGTV
Mason City	KGLO-TV
Sioux City	KVTV
Waterloo, Cedar Rapids	KWWL-TV, WMT-TV, KCRI-TV
KANSAS	
Pittsburg	KOAM-TV
Topeka	WIBW-TV
Wichita, Hutchinson	KEDD, KTVH, WOTH-TV
KENTUCKY	
Henderson, Evansville, Ind.	*WEHT, *WFIE-TV
Louisville	WAVE-TV, WHAS-TV
LOUISIANA	
Baton Rouge	WAFB-TV
Lake Charles	KTAG-TV
Monroe	KNOE-TV
New Orleans	WDSU-TV, WJMR-TV
Shreveport	KSLA
MAINE	
Bangor	WABI-TV
Portland	WCSH-TV, WGAN-TV
MARYLAND	
Baltimore	WBAL-TV, WMAR-TV, WAAM-TV
Salisbury	WBOC-TV
MASSACHUSETTS	
Boston	WBZ-TV, WNAC-TV, WTAO-TV
Springfield	WWLP, WHYN-TV
Pittsfield	WMGT
Worcester	WWOR-TV
MICHIGAN	
Ann Arbor	WPAG-TV
Detroit	WWJ-TV, WJBK-TV, WXYZ-TV, CKLW-TV
Grand Rapids	WOOD-TV
Kalamazoo	WKZO-TV
Lansing	WJIM-TV, WILS-TV
Saginaw, Bay City	WNEM-TV, WKNX-TV, WSBM-TV

(Continued on page 46A)



The Powerkeet can hop off with efficiency and gobble up costly power unless you're careful to keep him caged by observing the simple, sensible practices outlined in the *Champion Maintenance Manual** and by maintaining a plentiful supply of efficient, dependable, long-lasting CHAMPION Lamps.

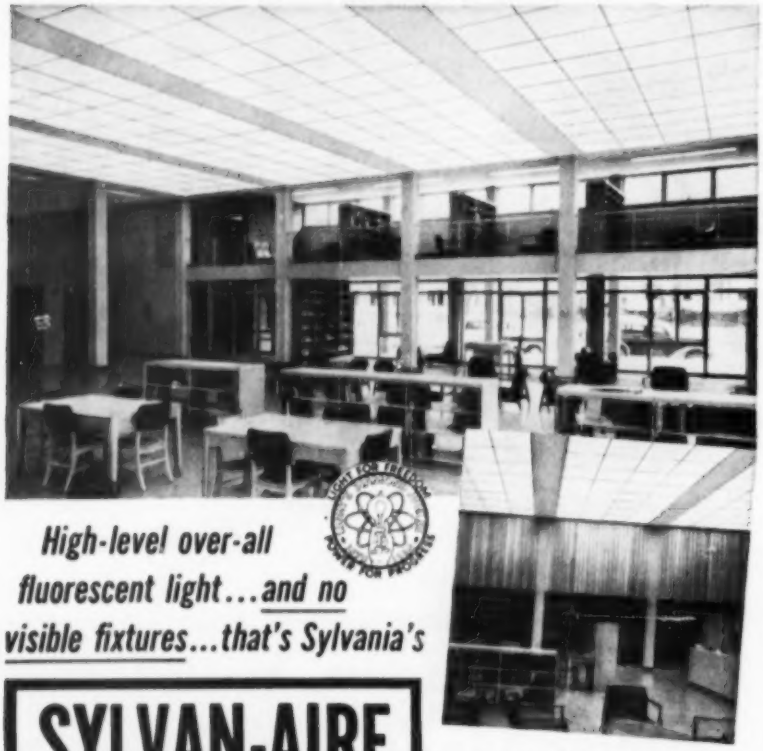
**Let us mail you a complimentary copy.*

CHAMPION LAMP WORKS

588 Broad Street, Lynn, Massachusetts

CHAMPION

Here's a New Sylvania LIGHTING SYSTEM!



High-level over-all fluorescent light... and no visible fixtures... that's Sylvania's

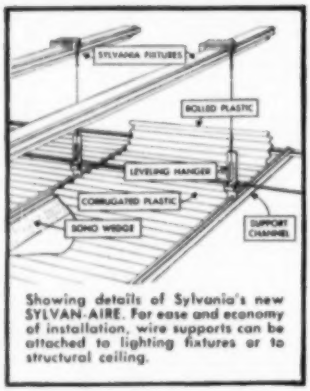
SYLVAN-AIRE

Two views of SYLVAN-AIRE Lighting System in High Point, North Carolina Library.

This SYLVAN-AIRE system actually serves three purposes.

1. It provides a source of soft but ample over-all light.
2. Made of corrugated, translucent plastic, it imparts a new beauty and character to any room.
3. Designed with alternating acoustical strips or wedges to help hold sound to comfortable levels.

Quick, easy installation and extremely low maintenance costs are other big advantages. For new descriptive literature write to Dept. 4X-3509 at Sylvania.



Showing details of Sylvania's new SYLVAN-AIRE. For ease and economy of installation, wire supports can be attached to lighting fixtures or to structural ceiling.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

Stations Carrying Jubilee Television Show

(*Continued from page 45A*)

	MINNESOTA
Duluth, Superior	KDAL-TV, WDSM-TV
Minneapolis, St. Paul	KSTP-TV, *WCCO-TV, WMIN-TV/WCTN-TV
Rochester	KROC-TV
	MISSISSIPPI
Jackson	WLBT, WJTV, WSLI-TV
Meridian	WTOK-TV
	MISSOURI
Cape Girardeau	KFVS-TV
Columbia	KOMU-TV
Kansas City	*WDAF-TV, KMBC-TV/WHB-TV, KCMO-TV
St. Joseph	WFEQ-TV
St. Louis	KSD-TV, *KWK-TV, KSTM-TV, WTVI
Springfield	KYTV, KITS-TV
	NEBRASKA
Kearney	KHOL-TV
Lincoln	KOLN-TV
Omaha	WOW-TV, *KMTV
	NEW HAMPSHIRE
Manchester	WMUR-TV
Mt. Washington	WMTW
	NEW JERSEY
Asbury Park	WRTV
	NEW MEXICO
Albuquerque	KOB-TV, KGGM-TV
	NEW YORK
Albany	WTRI, WROW-TV
Binghamton	WNBF-TV
Buffalo	WGR-TV, WBEN-TV, WEUF-TV
Elmira	WECT-TV, WTVE
Kingston	WKNY-TV
New York	WNBT, WCBS-TV, WABC-TV, WABD
Rochester	WHAM-TV, WHEC-TV/WBET-TV
Schenectady	WRGB
Syracuse	WSYR-TV, WHEN
Utica	WKTV
Watertown, Carthage	WWNY-TV
	NORTH CAROLINA
Asheville	WISE-TV, WLOS-TV
Charlotte	WAYS-TV, WBTV
Durham	WTVD
Greensboro	WFMY-TV
Greenville	WNCT
Raleigh	WNOA-TV
Winston-Salem	WSJS-TV, WTOB-TV
	NORTH DAKOTA
Fargo	*WDAY-TV
Minot	KCJB-TV
	OHIO
Akron	WAKR-TV
Cincinnati	WLW-T, WKRC-TV, WCPO-TV
Cleveland	WNBK, WEWS, WXEL-TV
Columbus	WLW-C, WBNS-TV, WTVN
Dayton	WLW-D, WHIO-TV
Lima	WLOK-TV
Steubenville, Wheeling, W. Va.	WSTV-TV, WTRF-TV
Toledo	*WSPD-TV
Youngstown	WFMJ-TV, WKNB-TV
Zanesville	WHIZ-TV
	OKLAHOMA
Ada	KTEN
Oklahoma City	WKY-TV, KWTV, KTVQ
Tulsa	*KCEB, KOTV
	OREGON
Eugene	KVAL-TV
Medford	KBES-TV
Portland	KPTV, KOIN-TV
	PENNSYLVANIA
Altoona	WFBG-TV
Bethlehem	WLEV-TV
Easton	WGLV
Erie	WICU, WSEE-TV
Harrisburg	WTPA, WHP-TV
Johnstown	WJAC-TV
Lancaster	WGAL-TV
New Castle	WKST-TV

Philadelphia	WPTZ, *WCAU-TV, WFIL-TV
Pittsburgh	WDTV
Reading	WEEU-TV, WHUM-TV
Scranton	WGBI-TV, WARM-TV
Wilkes-Barre	WBRE-TV, WILK-TV
York	WSBA-TV, WNOW-TV
RHODE ISLAND	
Providence	*WJAR-TV, *WPRO-TV, WNET
SOUTH CAROLINA	
Anderson	WAIM-TV
Charleston	WUSN-TV, WCSC-TV
Columbia	WIS-TV, WNOK-TV
Florence	*WBTW
Greenville	WFBC-TV, WGVL
TENNESSEE	
Chattanooga	WDEF-TV
Johnson City	WJHL-TV
Knoxville	WATE-TV, WTSK-TV
Memphis	WMCT, WHBQ-TV
Nashville	*WSM-TV, WLAC-TV, WSIX-TV
TEXAS	
Abilene	*KRBC-TV
Amarillo	KGNC-TV, KFDA-TV
Austin	KTBC-TV
Dallas	WFAA-TV, KRLD-TV
El Paso	KTSM-TV, KROD-TV
Ft. Worth	WBAP-TV
Galveston, Houston	KPRC-TV, KGUL-TV
Lubbock	KCBD-TV, KDUB-TV
San Angelo	*KTXL-TV
San Antonio	*WOAI-TV, *KGBS-TV
Temple, Waco	KCEN-TV
Texarkana	KCMC-TV
Tyler	KETX-TV
Wichita Falls	KFDX-TV, KWFT-TV
UTAH	
Salt Lake City	KUTV, KSL-TV, KTVT
VIRGINIA	
Danville	WBTM-TV
Harrisonburg	WSVA-TV
Lynchburg	WLVA-TV
Norfolk	WVEC-TV, WTAR-TV, WTOV-TV
Richmond	WTVR
Roanoke	WSLS-TV
WASHINGTON	
Bellingham	KVOS-TV
Seattle, Tacoma	KOMO-TV, KTNT-TV
Spokane	KHQ-TV, KXLY-TV
Yakima	KIMA-TV
WEST VIRGINIA	
Charleston	WCHS-TV, WKNA-TV
Huntington	*WSAZ-TV
Wheeling	WTRF-TV
WISCONSIN	
Appleton	WNAM-TV
Eau Claire	WEAU-TV
Green Bay	WBAY-TV
La Crosse	WKBT
Madison	WKOW-TV, WMTV
Milwaukee	WTMJ-TV, WCAN-TV, WOKY-TV
WYOMING	
Cheyenne	KFBC-TV

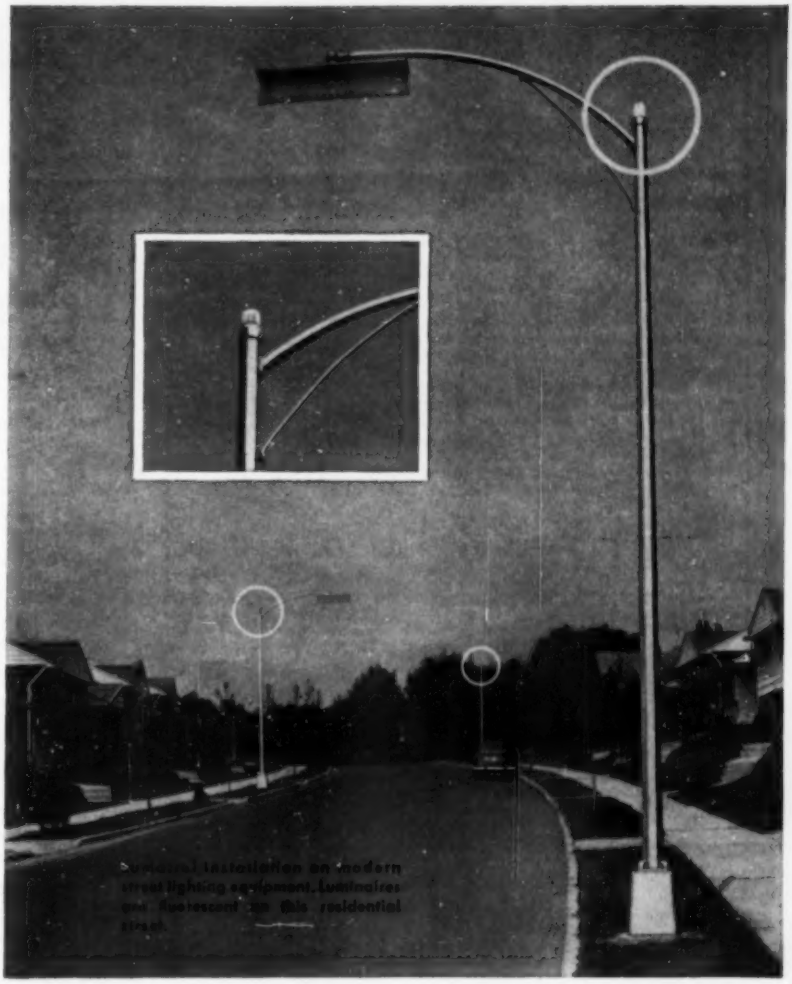
FOR SALE—BRIGHTNESS-METER

Guaranteed in perfect working order, one Luckiesh-Taylor Brightness-Meter for sale at just one-half cost. Has been used very little. Complete with leather case and Calibrator. Write for further information to Publications Office, Illuminating Engineering Society, 1860 Broadway, New York, N. Y.

Employment Opportunities

WANTED—SALES ENGINEER

Opportunity with manufacturer of lighting equipment for experienced man with degree in E.E. and sales ability, to call on architects, consulting electrical engineers, contractors, etc. Give experience, references, family status and salary desired. Replies confidential. Address Box 215, Publications Office, Illuminating Engineering Society, 1860 Broadway, New York, N. Y.



LUMATROL® omni-directional

photoelectric light switch.....

. . . the new, simple method of *fully* automatic light control

. . . the low-cost, plug-in unit that's easy to install, easy to maintain

. . . the light switch that stays on the job year after year regardless of weather

. . . the small-size switch that's easily adaptable to any pole or luminaire, *PRODUCING WELCOME ECONOMIES WHEREVER INSTALLED*

. . . LUMATROL RATES FIRST ON ALL TWELVE SPECIFICATIONS NORMALLY APPLIED TO THIS TYPE CONTROL . . .

WRITE TODAY FOR TECHNICAL BULLETIN

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INCORPORATED

GARDEN CITY PARK, L. I., NEW YORK

*Trade Mark Reg. U.S. Pat. Off.

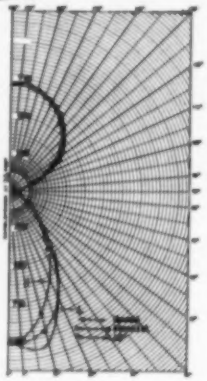
the ZANE "SENIOR"

FOR SCHOOLS and OFFICES

Designed to meet the highest standards for modern school and office lighting, the extremely versatile Zane "SENI 24B ST" luminaire has proved highly efficient in hundreds of installations.

In 45° x 45° shielding with steel sides, 75.5% efficiency is obtained. The unit is made for 35° x 25°, 35° x 45° and 45° x 45° shielding, with three different types of side panels.

ETL curves available on request. Zane fixtures are sold only through distributors.



LIGHT FLUX VALUES

Zone	Lumens Luminaire	Percent	Zone	Lumens Luminaire	Percent
0°-30°	723	14.5	0°-90°	1671	33.5
0°-40°	1048	21.0	90°-180°	2091	42.0
0°-60°	1443	29.0	0°-180°	3782	75.5

LUMINAIRE BRIGHTNESS

Shielding Angles 45°C-45°L

Angles	0°	0° I	20°	30°	35°	40°	45°	20°L	30°L	40°L	45°L	90°	90° I
C/Sq. In.	0.4	0.8	0.5	0.6	0.6	1.1	1.3	0.6	0.7	0.8	1.0	0.5	5.2

ETL Report issued April 8, 1954

Write for "Senior" Folder 954

ZANE MANUFACTURING CO.

20 EAST CONCORD ST. BOSTON, MASS.

LIGHTING FIXTURES

We design and fabricate ornamental lighting fixtures and lanterns of genuine bronze and wrought iron, for churches, schools, banks and public buildings, to your order or to your architect's specifications. No order is too large, none too small, to receive our personal attention.

Write for our profusely illustrated catalog. We will be glad to quote on your requirements.

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GIVES BETTER GENERAL DIFFUSE ILLUMINATION
ALSO CUTS INITIAL AND MAINTENANCE
COST *WAY DOWN!*

Or Write Dep't. "I" Today! **AINSWORTH LIGHTING INC.,** 38-10 29TH STREET LONG ISLAND CITY 1, N. Y.

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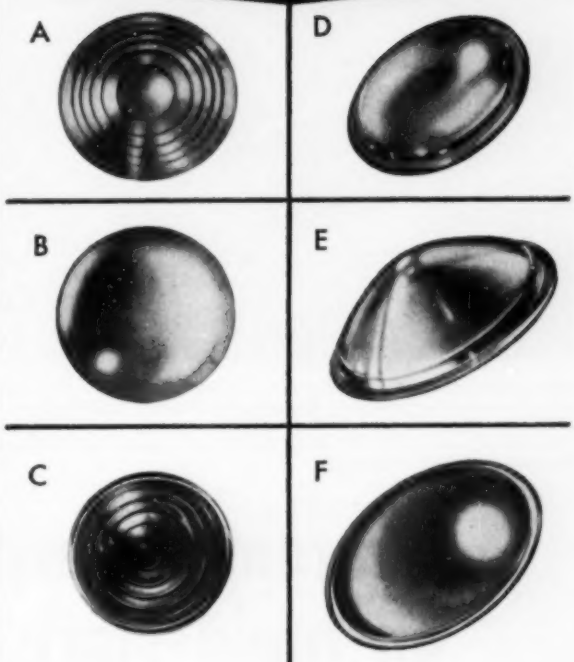
These Lancaster Stock Items Can Help Solve Your Lighting Glassware Problems



A. Pressed Flat Fresnel Lenses — heat-resisting and soda-lime glass — 3" to 8" diameters.

B. Ground and Polished Plano-Convex Condenser Lenses — soda-lime plate and heat-resisting glass — up to 10" diameters.

C. Semaphore Lenses — crystal and colored glass — various diameters.

D. Bullseye Lenses — crystal and colored glass — many diameters.

E. Shower Light Lens — crystal (inside frosted) — overall diameter, 5¼"; flange thickness approximately ⅛"; face projection, 4¾"; overall height approximately 1¾".

F. Roundels — crystal and colored glass — up to 12" diameters.

LANCASTER GLASS

THE Lancaster Lens CO.
Lancaster, Ohio

☐ Please send me your price list for stock items of lighting glassware.

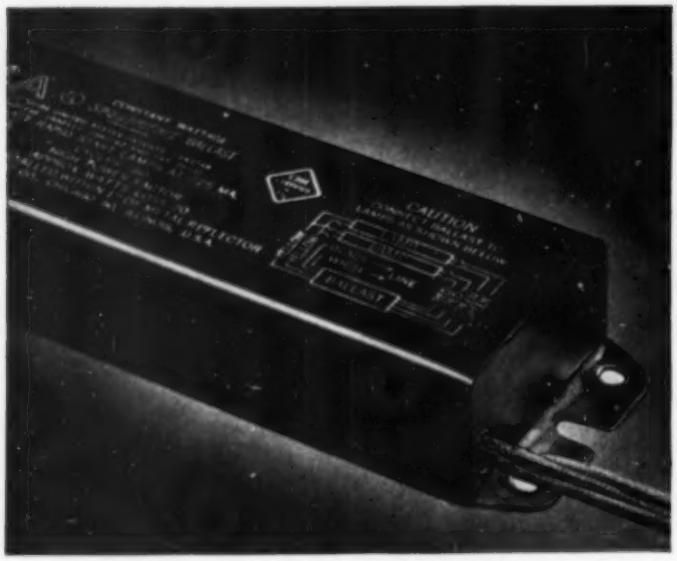
☐ Details of my custom lighting glassware problem are enclosed. I would appreciate your recommendations.

Name _____ Title _____

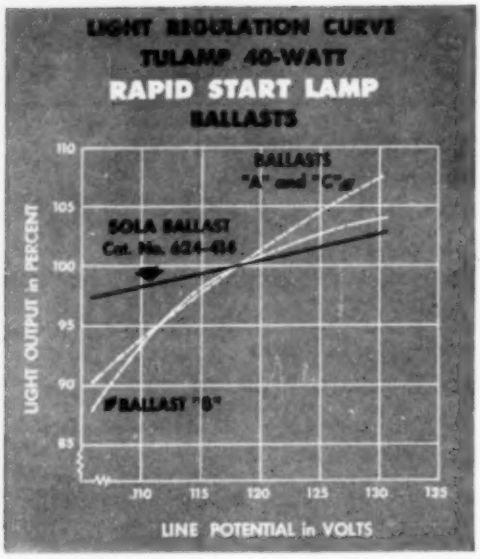
Firm _____

Street _____

City _____ Zone _____ State _____



LOW, COMPACT CASE — Case height 1-13/16", length 8-5/16", width 3-1/8". Fits all standard, rapid-start channels. Weighs only 5-1/2 pounds. Leads are adequate length for easy hook-up without splicing, and clearly color-coded for quick identification. The case is permanently labeled and includes a wiring diagram and electrical ratings.



CONSTANT LIGHT OUTPUT — Light output characteristics of a typical Sola Constant Wattage Rapid-Start Ballast compared with three typical, non-regulated ballasts. Constant wattage is an exclusive premium feature in a ballast of this small size and light weight.

Guarantee constant light output on rapid-start lighting systems with Sola Constant Wattage Ballasts

You design or specify a rapid-start lighting system to deliver a specific number of foot candles at a specific working surface. Your customer buys your system on the basis of that expected performance . . . but what happens to light output and lamp life when line voltage varies?

With ordinary, unregulated ballasts, lumen output and efficiency will drop significantly when line voltage drops . . . lamp life is shortened by line voltage surges. Sola Constant Wattage Ballasts maintain lumen output within ±2.5% or less, with line voltage variations as great as ±10% . . . lamp life is protected by regulation of lamp current.

In addition, they offer many other advantages: reliable starting, cool operation, self-protection against damaging heat rise when lamps fail, absolute safety when relamping, unusually quiet operation, compactness, light weight and moderate price.

You automatically guarantee all the light your customer expects when your rapid-start installation is ballasted with Sola Constant Wattage units. You guarantee your customer's satisfaction through continuous, dependable performance. Write for full information, or request a Sola sales engineer to call for all the facts.

Reduces relamping . . . keeps lumen output constant

SOLA *Constant Wattage* **BALLASTS**

CBM CERTIFIED by ETL

WRITE FOR NEW RAPID-START BULLETIN 31-FL-199

CONSTANT VOLTAGE TRANSFORMERS for Regulation of Electronic and Electrical Equipment • LIGHTING TRANSFORMERS for All Types of Fluorescent and Mercury Vapor Lamps. • SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • NEW YORK 36: 103 E. 125th St., TRafalgar 6-6464 • PHILADELPHIA: Commercial Trust Bldg., Rittenhouse 6-4908 • BOSTON: 272 Centre Street, Newton 58, Mass., Bigelow 4-3354 CLEVELAND 15: 1836 Euclid Ave., PRospect 1-6400 • KANSAS CITY 2, MO.: 406 W. 34th St., Jefferson 4382 • Representatives in Principal Cities

Because Certified Ballasts are "tailored to the tube" everybody benefits

The FIXTURE MANUFACTURER benefits...

Because satisfactory fluorescent fixture performance depends largely on the ballast. Customer dissatisfaction will eventually cost him money and his reputation. CERTIFIED CBM BALLASTS are Tailored to the Tube to assure best lighting performance.

The TUBE MANUFACTURER benefits...

Because he knows his tubes will give full lamp life and full light output when powered by CERTIFIED CBM BALLASTS that are tailored to the Tube.

The ARCHITECT or CONSULTANT benefits...

Because his clients want fluorescent lighting that will be reliable. Specify CERTIFIED CBM BALLASTS in all fluorescent units and you'll have happy clients.

The DISTRIBUTOR benefits...

Because he wants to stock and sell fluorescent fixtures that will give satisfactory performance. CERTIFIED CBM BALLASTS match accurately the requirements of the fluorescent tube used.

The CONTRACTOR benefits...

Because he can't afford to lose his reputation by using equipment that won't give satisfaction. Install CERTIFIED CBM BALLASTS to play safe.

The USER benefits...

Because he wants fluorescent lighting performance that is trouble-free, quiet and economical. CERTIFIED CBM BALLASTS assure him satisfaction.

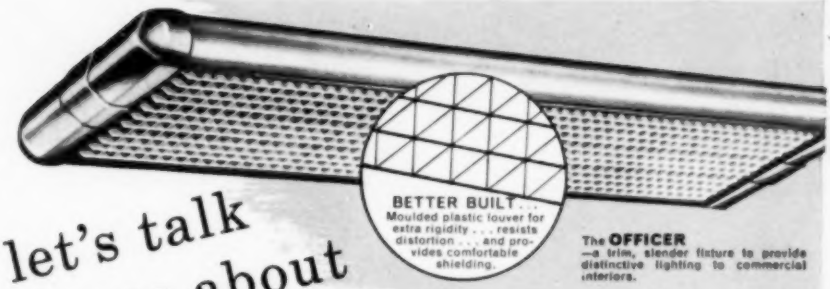
That's why, today, most fluorescent fixtures for general lighting service are equipped with

CERTIFIED BALLAST MANUFACTURERS

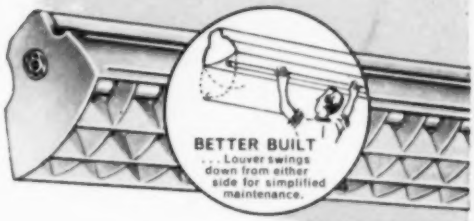
Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

let's talk business about



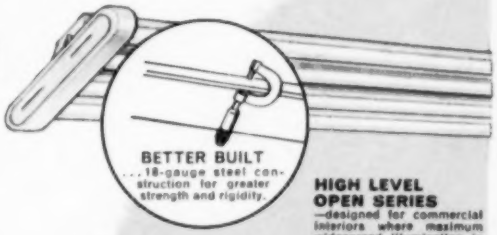
The **OFFICER**
—a trim, slender fixture to provide distinctive lighting to commercial interiors.



The **SCHOOLMASTER**
—an all-steel unit which provides upward light for comfort lighting. Ideal for close seeing.

what makes **BETTER BUILT** Lighting Units

BETTER BUSINESS for YOU!

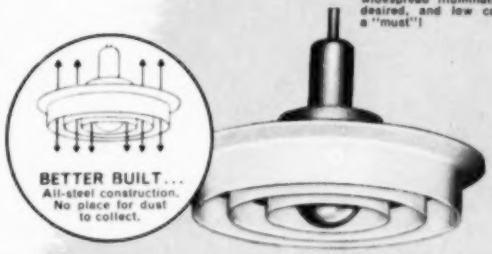


HIGH LEVEL OPEN SERIES
—designed for commercial interiors where maximum widespread illumination is desired, and low cost is a "must"!

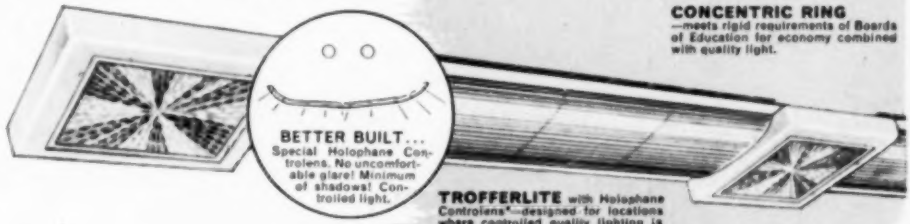
It is good business to insist on units with "Better Built" features like those illustrated here. That's because such features help cut operating costs, speed up and simplify maintenance, and insure reduced obsolescence and long-life dependability.

It is good business for the user, because such units give better service and save more money. It is good business for those who recommend and install lighting equipment, because the installation of such units results in greater satisfaction and increased good will.

Shown here are but a few Benjamin Leader Line units, each with just one of its "Better Built" features. Manufacturing "Better Built" lighting equipment is a tradition with Benjamin. That's why you can rely on getting Benjamin Quality in every Leader lighting unit.



CONCENTRIC RING
—meets rigid requirements of Boards of Education for economy combined with quality light.



TROFFERLITE with Holophane Controlens*—designed for locations where controlled quality lighting is desired.

*Copr., the Holophane Co.

For a complete showing of the Benjamin Leader Line, send for our FREE CATALOG.

BETTER BUILT
TO SERVE YOU BETTER

BENJAMIN
TRADE MARK
Leader Line

Exclusive licensee of the Leader Line in Canada: Robertson Irwin Limited, Hamilton, Ontario

Sold Exclusively through Electrical Distributors

Leader Division of Benjamin Electric Manufacturing Company, Dept. I, Des Plaines, Illinois . . . makers of famous Benjamin and Leader Line lighting equipment and sound signals for industry, institutions and Commerce.

B-6871